AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Link Advertising To Merchandising

This nation of 100,000,000 people cannot be handled efficiently from a sales standpoint until it is broken up into sections. Every large organization purporting to cover the entire United States finds branch houses, district managers, sales territories, etc., absolutely imperative. With population equal to half a dozen European kingdoms, and vast distances, it becomes elementary common sense to break the United States up into a number of logical merchandising units such as are shown on the map above.

This map pictures how each of these zones, and therefore the entire United States, can be covered by advertising in the forty-eight cities indicated, using newspapers with radiating circulation. The last four columns of the tabulation below prove that metropolitan newspapers cover the territory OUTSIDE the cities in which they are published even better than this territory is covered by any magazine.

Cultivate Each Jobbing Zone Intensively by Means of Metropolitan Newspapers

No jobber can sell the Chicago grocer but the Chicago jobber. No jobber can sell the San Francisco grocer but a San Francisco jobber. The grocers of Vinton, Iowa, are sold by jobbers from Chicago and from Iowa cities, but seldom by New York jobbers. The grocers of White Pigeon, Michigan, are sold by jobbers from Michigan and from Chicago, but never by jobbers from Philadelphia.

These are obvious merchandising axioms. One would think that his everyday knowledge of their truth would inspire every advertiser to adopt the corollary of localized advertising effort. Nevertheless, many advertisers seem to feel that general publicity thinly spread over a continent constitutes "national" advertising. As a matter of fact it is merely "geographical" advertising—advertising which covers the **map** of the United States but does not reach the **people** of the United States. The only true **national** advertising is that which moves the American people.

Note that the 78 Sunday newspapers listed below have a circulation in excess of 10,000,000 and a rate of .0015 per agate line per thousand. Twenty-one "general" or "standard" magazines have a combined circulation of 6,184,658 with considerable duplication and a rate per agate line per thousand four times that of the 78 Sunday newspapers.

	NO. OF CITIES	FAMILIES IN CITIES	FAMILIES OUTSIDE	MORNING NEWSPAPERS	CIRCULATION	GROSS RATE MORNING	EVENING NEWSPAPERS	CIRCULATION	GROSS RATE EVENING	SUNDAY NEWSPAPERS	CIRCULATION	GROSS RATE SUNDAY	SUNDAY CITY CIRCULATION	FAMILIES PER NEWSPAPER IN CITIES	SUNDAY OUTSIDE CIRCULATION	FAMILIES PER NEWSPAPER OUTSIDE CITIES
Zone 1..	1	514,823	916,504	2	597,598	.55	1	220,771	.20	2	693,367	.70	423,964	1.214	268,082	3.415
Zone 2..	4	1,818,774	825,504	7	1,206,067	2.03	5	1,193,283	1.53	8	2,131,744	2.64	1,454,665	1.25	667,463	1.238
Zone 3..	6	1,260,697	1,649,047	9	703,808	1.46	7	948,897	1.36	12	1,404,994	2.41	966,171	1.305	422,477	3.905
Zone 4..	5	215,275	1,338,257	5	154,547	.39	1	59,017	.08	6	268,413	.425	137,657	1.61	128,967	11.376
Zone 5..	6	723,176	1,213,420	7	941,594	1.15	4	329,479	.705	9	862,403	1.565	505,953	1.429	346,592	3.501
Zone 6..	3	369,762	852,910	3	125,037	.29	2	120,364	.20	5	302,162	.605	218,094	1.695	81,263	10.742
***Zone 7..	***5***	***1,201,200***	***2,148,605***	***5***	***759,436***	***.94***	***5***	***644,883***	***.75***	***7***	***1,348,629***	***1.67***	***835,525***	***1.438***	***490,331***	***4.382***
Zone 8..	3	372,841	1,463,566	3	459,026	.6075	2	377,225	.5475	4	789,973	1.15	408,138	.911	379,340	3.858
Zone 9..	4	134,730	833,209	4	171,601	.42	2	83,685	.25	6	324,585	.72	194,516	.693	126,309	6.597
Zone 10..	3	187,975	645,681	3	160,064	.21	3	512,062	.38	4	366,164	.56	173,286	1.085	187,131	3.449
Zone 11..	3	156,760	411,655	4	155,357	.245	4	232,810	.335	6	419,198	.635	203,457	.77	209,050	1.969
Zone 12..	2	350,000	310,187	4	413,507	.785	....	....	....	4	741,486	1.22	396,980	.7	233,438	1.329
Zone 13..	3	230,000	329,707	3	155,091	.37	2	135,707	.25	5	358,294	.725	229,728	1.001	119,507	2.759
TOTAL..	48	7,536,010	12,911,315	59	5,489,755	9.4475	38	4,858,183	6.5875	78	10,011,412	15.025	5,148,134	1.226	3,659,947	3.528

**Zone 7 is the Chicago Territory, dominated by The Chicago Tribune.*

The material on this page is but a brief extract from the 1919 BOOK OF FACTS on advertising and merchandising which The Tribune will send free to manufacturers, agents and advertising or sales managers if requested on business letter-head

The Chicago Tribune

THE WORLD'S GREATEST NEWSPAPER

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XL NEW YORK—THURSDAY, JUNE 5, 1919—CHICAGO No. 23

Indianapolis Speedway Adopts the 3-Liter Limit for Future Races

Recent Contest Convinced Officials That 300 Cu. In. Cylinder Displacement Cars Had Developed Too Much Speed for Track — 183 Cu. In., New Maximum, Is Same as for French Grand Prix — Europe's New Cars a Disappointment — Mechanical Notes

INDIANAPOLIS, June 2—Next year's 500-mile classic in the speedway here will be confined to cars having a maximum cylinder displacement of 183 cu. in. This was announced, after Saturday's race, by Carl Fisher, the moving spirit behind the oval. Fisher said that he and his associates had become convinced that the 300 cu. in. cars have developed too much speed for the track, also that the track was too rough for 500 miles at the speed of the larger cars.

Fisher's idea is that, as the Indianapolis track is maintained for the purpose of developing motor cars, its best service to the industry will be the encouragement of smaller engines and lighter cars. His position is that there are many more cars being made with a smaller displacement than 300 cu. in. than there are above that figure.

The new limitation is the 3-liter limit adopted for the French Grand Prix and is the size to which all of the new European racing models will be built. With the support of the French rule, it is not anticipated that there will be any objection to this decision on the part of the Indianapolis officials. It will probably encourage European competition, but it will not lessen the advantage that will come to American racing and the American industry. It is worthy of note that Boillot's baby Peugeot is even smaller than the new limit, and this car ran well until it turned over within 20 miles of the finish, when it was in third place.

The victory of Howard Wilcox, driving a Speedway-owned Peugeot, was not a victory of speed so much as it was a victory of preparedness, thorough acquaintance with the track, and generalship, combined, as always, with good luck. The Peugeot is the same car with which the late Aitken campaigned so successfully. It has been worked over so much and so many parts of American manufacture incorporated, that it cannot now be called foreign. Wilcox has it in such shape that he went through the race without having to make adjustments. His three short halts at the pits were for tires and supplies. He did not drive exceptionally hard; made no exceptionally fast laps. He won because others, who drove faster while on the track, could not keep going.

The race this year did not make a record for the distance. Wilcox's time was more than 10 minutes longer than DePalma's record for the 500 miles in 1915. Saturday's average speed was 87.12 m.p.h., 2.72 m.p.h. less than the 1915 records.

If DePalma or Gaston Chevrolet, who between them led the field for the first half of the race, could have kept on the track, the record for the distance would have been broken. DePalma led the field for the first 150 miles at an average of better than 92 m.p.h. His stop threw Chevrolet in the lead and the speed dropped to 90 m.p.h. The Italian gained the lead again and pushed the pace up to 91.6 m.p.h., until valves and wheel bearings checked him. His speed of 92.20 at the 100-mile mark is a track record for that distance.

Wilcox led almost the entire last half of the race, taking the pace when the Packard was held at the pits for repairs. The Peugeot, which the winner drove, was well up among the leaders most of the way. It was in third place at 25 miles and second at 50. Then Wilcox fell out of the money for nearly 50 miles, but, climbing steadily, at 125 miles he was back in third place and crowding DePalma and Gaston Chevrolet. He took second place when the Frontenac hung up at the pits at 200 miles and was in

Official Time of the 33 Starters in the 500-Mile Victory Swe

Car No.	Name of Car	Driver	25 Miles Hr Min Sec	50 Miles Hr Min Sec	75 Miles Hr Min Sec	100 Miles Hr Min Sec	125 Miles Hr Min Sec	150 Miles Hr Min Sec	175 Miles Hr Min Sec	200 Miles Hr Min Sec	225 M Hr Mi
1	Chevrolet	Clif. Durant	0:20:00.40	0:36:10.25	1:01:19.90	1:17:58.00	1:35:03.35				
2	Frontenac	R. Mulford	0:15:12.00	0:32:41.90	0:49:32.90						
3	Peugeot	H. Wilcox	0:14:56.25	0:30:54.45	0:48:34.90	1:04:53.50	1:21:20.45	1:37:55.95	1:54:23.25	2:10:07.40	2:26:
4	Packard	R. De Palma	0:14:55.20	0:29:20.70	0:45:40.40	1:01:31.45	1:17:36:95	1:36:16.90	1:52:43.25	2:08:31.50	2:24:
5	Richards	W. Brown	0:15:22.80								
6	Peugeot	Jules Goux	0:15:25.00	0:31:41.30	0:52:01.80	1:09:11.90	1:26:24.70	1:43:35.70	2:00:58.60	2:18:50.40	2:35:
7	Frontenac	L. Chevrolet	0:15:05.70	0:29:29.90	0:46:01.65	1:02:32.50	1:18:59.80	1:37:01.70	1:52:23.90	2:09:16.50	2:28:
8	Stutz	Earl Cooper	0:14:57.65	0:31:00.90	0:47:41.90	1:04:29.90	1:21:20.80	1:38:16.75	1:55:09.85	2:11:42.15	2:28:
9	Duesenberg	Tom Milton	0:15:28.10	0:31:37.30	0:48:31.55	1:04:52.15	1:25:18.85				
10	Duesenberg	E. O'Donnell	0:15:27.20	0:32:01.85	0:48:57.90	1:05:41.85	1:22:59.90	1:40:27.70			
12	Roamer	Kurt Hitke	0:15:34.35	0:32:05.40	0:49:21.50	1:06:15.75	1:26:38.75				
14	Durant	Eddie Hearne	0:15:13.90	0:31:15.55	0:47:56.85	1:04:57.45	1:22:10.90	1:40:28.55	1:57:26.45	2:14:24.70	2:31
15	Roamer	L. Le Cocq	0:15:31.00	0:32:02.00	0:48:59.85	1:05:37.95	1:23:13.90	1:40:24.90	1:57:10.10	2:13:24.90	2:29
17	Hudson	Ora Haibe	0:19:59.70	0:41:38.65	0:59:40.90	1:16:58.10	1:40:15.70	1:58:42.00	2:16:26.00	2:35:48.30	2:53
18	Thurman	A.Thurman	0:15:44.40	0:30:30.00	0:52:59.10	1:09:45.30					
19	Detroit	C. Kirkpatrick	0:16:01.70	0:39:58.85	1:08:01.80	1:29:37.65	1:49:12.35	2:16:06.00	2:48:55.50		
21	Stickel	D. Hickey	0:16:13.45	0:35:19.35	0:53:16.60	1:11:22.75	1:28:16.25	1:46:36.90	2:04:07.15	2:21:58.00	2:40
22	Duesenberg	W. D'Alene	0:15:18.45	0:30:21.20	0:47:38.20	1:04:43.90	1:22:10.20	1:39:41.25	2:02:03.90	2:17:34.40	2:34
23	Shannon	E. Shannon	0:17:09.80	0:35:45.35	0:54:05.80	1:12:12.40	1:32:05.40	1:50:03.55	2:07:36.90	2:28:16.25	2:46
26	Bender	Tom Alley	0:17:15.05	0:33:46.75	0:51:29.45	1:08:38.90	1:26:10.80	1:43:38.45	2:00:39.50	2:21:58.00	2:38
27	Hudson	Ira Vail	0:15:32.25	0:32:06.90	0:51:14.10	1:08:22.90	1:25:38.50	1:43:09.95	2:02:08.90	2:19:39.35	2:37
28	Oldfield	R. Sarles									
29	Peugeot	Art. Klein	0:15:21.20	0:33:49.90	0:51:27.35	1:08:45.55	1:26:05.95	1:43:27.85	2:19:18.45		
31	Ballot	Rene Thomas	0:14:56.75	0:30:55.30	0:47:16.95	1:05:09.50	1:21:29.90	1:38:45.20	2:05:39.95	2:23:20.85	2:41
32	Ballot	A. Guyot	0:15:08.85	0:31:08.95	0:47:45.35	1:04:20.90	1:21:13.90	1:44:56.30	2:02:00.90	2:18:51.65	2:37
33	Ballot	P. Bablot	0:15:29.50	0:31:24.15	0:47:17.95	1:05:03.75	1:25:18.30	1:42:24.45			
34	Ballot	L. Wagner	0:14:59.90	0:31:00.40	0:49:29.25	1:06:02.90					
36	McCoy	J. J. McCoy	0:20:26.25	0:39:41.25	0:59:04.85						
37	Baby Peugeot	A. Boillot	0:16:47.15	0:33:45.85	0:49:28.50	1:07:05.90	1:24:45.35	1:42:26.00	2:00:01.15	2:17:11.35	2:3
39	Frontenac	Joe Boyer	0:15:09.80	0:29:34.30	0:46:08.90						
41	Frontenac	G. Chevrolet	0:16:49.90	0:31:05.30	0:49:20.30	1:05:51.15	1:24:01.80	1:40:38.30	1:57:08.00	2:17:08.30	2:3
43	Toft	Omar Toft	0:16:46.10	0:34:35.50	0:52:53.75	1:11:36.90					
48	Peugeot	Ray Howard	0:16:04.20	0:33:01.35	0:50:26.70	1:07:58.10	1:25:55.50	1:44:43.80	2:17:25.55	2:44:55.20	3:0

position to take advantage of DePalma's difficulty at the halfway mark. This put Wilcox in first place with only a slight lead over Cooper. The menace of the Stutz ceased, however, when the Californian stuck a valve, but continued, slowly dropping behind while the engine thumped a wail of protest that could be heard half around the track.

By the time the race was within 60 miles of the finish, the field had divided itself into two sections. With Wilcox leading Hearne by 5 miles, and 14 miles ahead of Goux for third, Alley, Guyot and Louis Chevrolet, at the wheel of Gaston's car, were fighting for position. This bunch of six cars was 40 miles ahead of the rest of the field, with Vail's Hudson and Boillot's Baby Peugeot fighting for the doubtful honor of leading the second contingent.

Hearne Finishes Second

Hearne, by heady driving, brought his Durant Special into second money and finished less than 2 minutes behind the leader. He made only two stops and these for supplies. Like Wilcox, Hearne scored by steady, consistent driving. There never was a time during the race when he was not in the money and he climbed till, when the race was half over, he was in second place and only 10 miles behind the leader. This was the status till Willcox stopped to prepare for the final dash, which gave Hearne a chance to pick up two laps.

The Durant Special which Hearne drove was entered by Clifford Durant, son of W. C. Durant, one of the big men of the industry. The car is the Stutz that Gil Anderson drove.

Two Out of Four Ballots Finished

Another Speedway-owned Peugeot captured third place under the piloting of Jules Goux, winner of the 1913 sweepstakes. Goux did not show among the contenders until the race was about half over, but at 350 miles he had climbed into fourth place, jumping to third with 50 miles to go when the Frontenac got into difficulties. Goux made only 5 stops, all of short duration.

Of the four Ballots started, only two finished, but both in the money. Guyot captured fourth place, and Rene Thomas, winner of the 1914 race, nosed into the purse for tenth place. The other two came to grief. Bablot's machine, with Chassagne, the former Sunbeam pilot, at the wheel, turned over. Louis Wagner's machine broke a wheel early in the day.

The Ballot cars, built especially for this race at an expense of $120,000, and brought over from France with a

Sweepstakes Race on the Indianapolis Speedway, May 31

225 Miles Hr Min Sec	250 Miles Hr Min Sec	275 Miles Hr Min Sec	300 Miles Hr Min Sec	325 Miles Hr Min Sec	350 Miles Hr Min Sec	375 Miles Hr Min Sec	400 Miles Hr Min Sec	425 Miles Hr Min Sec	450 Miles Hr Min Sec	475 Miles Hr Min Sec	500 Miles Hr Min Sec	Pos. at Finish
2:26:10.50	2:42:08.75	2:58:57.20	3:18:45.50	3:35:27.75	3:51:56.90	4:08:27.55	4:25:31.16	4:42:57.15	5:05:02.40	5:22:35.65	5:40:42.87	1
2:24:15.90	2:40 18.40	3:15:26.40	3:31:56.85	3:46:44.80	4:03:07.80	4:19:38.25	5:04:04.90	5:20:42.70	5:37:27.90	5:53:58.30	6:10:10.64	6
2:35:53.35	2:53:08.20	3:12:58.30	3:30:05.45	3:47:41.10	4:04:56.90	4:22:01.75	4:40:22.35	4:57:26.30	5:14:36.93	5:31:42.40	5:49:06.18	3
2:28:48.50	2:45:27.75	3:27:11.30	3:46:03.00	4:06:07.10	4:23:58.50	4:43:04.85	5:01:50.30	5:19:03.20	5:37:37.90	5:53:58.75	6:10:10.92	7
2:28:24.45	2:47:29.95	3:05:35.45	3:23:36.35	3:55:43.95	4:13:45.65	4:34:15.15	4:59:56.30	5:20:36.35	5:42:10.15	6:02:58.60	6:21:35.05	
2:31:27.00	2:48:16.10	3:05:34.60	3:25:09.95	3:42:12.85	3:59:12.55	4:16:23.50	4:33:28.95	4:50:31.00	5:08:03.20	5:26:20.10	5:44:29.04	2
2:29:48.25												
2:53:35.90	3:11:50.35	3:29:44.90	3:47:19.40	4:08:01.50	4:26:08.30	4:46:51.20	5:19:03.25	5:37:21.60	5:56:48.80	6:15:33.90	6:34:28.09	
2:40:19.40	2:59:28.90	3:23:55.45	3:43:27.75	4:02:48.45	4:21:24.35	4:41:40.00	5:00:21.25	5:18:52.65	5:37:46.55	5:56:01.60	6:13:57.24	9
2:34:54.70	2:53:10.50	3:12:28.65	3:33:22.90									
2:46:47.30	3:06:25.60	3:26:24.80	3:48:48.60	4:08:05.25	4:27:12.20	4:48:08.25	5:09:43.35	5:31:12.90	5:50:35.80	6:12:14.65	6:30:50.75	
2:38:59.50	2:56:45.00	3:14:23.15	3:31:55.85	3:49:26.90	4:06:38.20	4:26:02.65	4:43:32.75	5:09:31.85	5:27:47.70	5:46:12.85	6:05:03.92	5
2:37:04.25	2:56:57.70	3:15:44.80	3:34:35.90	3:53:30.90	4:12:18.10	4:34:29.35	4:53:56.30	5:13:28.00	5:33:19.35	5:53:42.90	6:12:42.85	8
2:41:07.00	3:07:33.20	3:25:43.90	3:44:25.60	4:03:39.60	4:28:42.55	4:47:03.55	5:05:19.90	5:23:58.35	5:42:30.30	6:00:48.00	6:21:10.92	
2:37:31.80	2:54:48.35	3:12:35.90	3:34:52.90	3:52:20.85	4:09:47.65	4:26:55.35	4:45:58.28	5:03:03.35	5:20:10.93	5:38:38.55	5:55:16.27	4
2:34:25.00	2:51:26.50	3:09:03.85	3:26:24.80	3:43:57.40	4:04:17.95	4:22:09.25	4:40:03.60	5:00:54.15	5:18:24.40	5:35:54.75		
2:33:32.30	2:49:52.50	3:06:41.90	3:23:26.45	3:39:53.70	3:57:13.10	4:25:47.35	4:42:09.30	5:09:38.25	5:43:36.95	6:00:20.90	6:17:21.79	10
3:09:10.50	3:32:47.90	3:53:50.85	4:21:07.75	5:18:28.85								

crew of Europe's best drivers, did not come up to expectations. That they had speed was shown in practice and in the elimination trials. They did not stand the 500 miles on the bricks. Guyot only made three stops, and these not of long duration. Thomas made five stops for supplies and tires. He seemed to be taking things very easy.

Joe Boyer, in his Frontenac, threw a left rear wheel and broke the axle. The accident occurred near the pits and the car coasted in on the hub of the broken wheel.

This accident resulted in a serious tie-up of the whole race.

Toft Seriously Injured

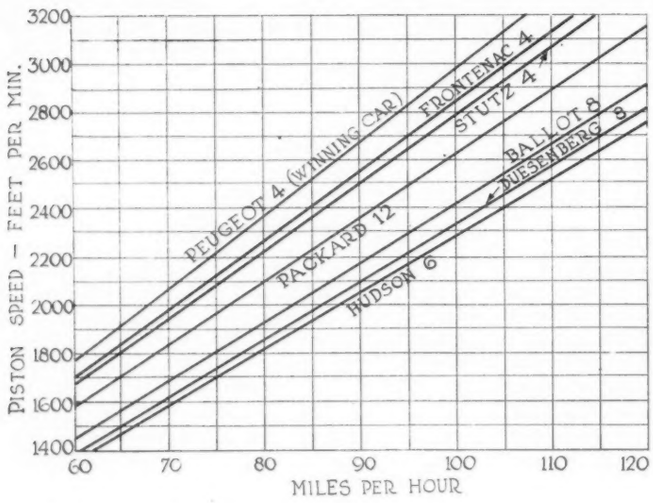
The car crossing the timing wire with its broken wheel cut the timing wire. Omar Toft in his Toft Special was following Boyer. The wire released from the tension of the springs curled up in the air and struck Toft, cutting him severely in the throat and opening the jugular vein. Toft was bleeding profusely, but continued to drive his car. He was forced to stop for medical attention, though, in the thirtieth lap. Inspection showed that he was injured rather severely and therefore did not continue the race.

The breaking of the timing wire also caused some commotion in the timing stand. A new wire was hastily substituted and the click of the chronometer continued.

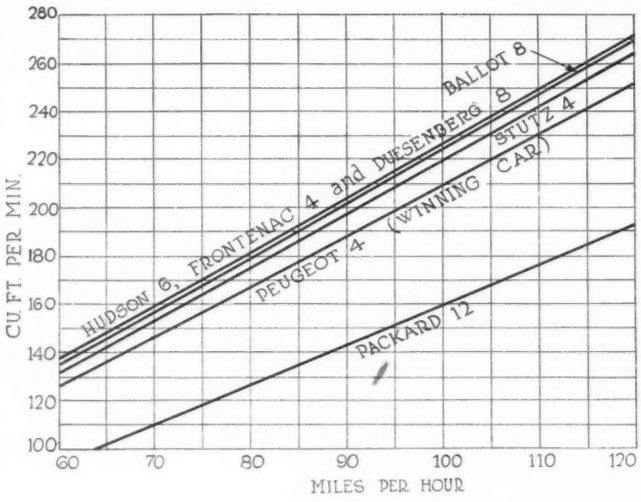
The real race was between Louis Chevrolet and DePalma for sixth and seventh places. Lap after lap they fought, DePalma coming up from the ruck after changing a wheel bearing and Chevrolet fighting to make up the time lost in changing a steering knuckle. The battle brought the grandstand folk to their feet time after time, this after the race had been won. So close was the finish that only a re-check of the timing tape could determine who got in first. In the re-check DePalma, who had been given sixth, unofficially, had to take seventh in favor of Chevrolet.

The Frontenacs seemed too lightly constructed for the track. Boyer lost a wheel and Louis Chevrolet lost two by the aluminum drum failing. The latter also broke a steering knuckle and Mulford broke an axle driveshaft.

It was estimated by Speedway officials that there were over 100,000 present. In addition there were a great number of machines in the center of the oval and around the inside of the ring. The roads leading to the course were heavily congested with traffic an hour after the race had started.



Piston speeds in feet per minute of some of the cars in the race



Cubic feet of gas displaced per minute at different speeds by some of the cars

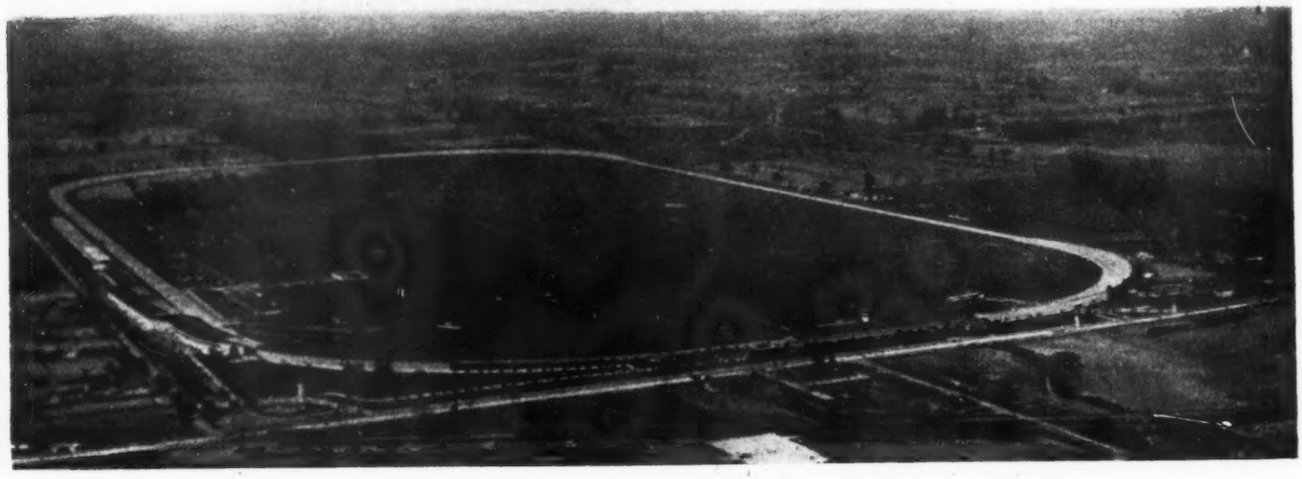
Mechanical Notes from the Race

One of the best reasons for racing is that it enables us to determine the weakest links in the chain of car components and by this knowledge to profit in the design and construction of vehicles intended for passenger or commercial purposes. The mortality among racing cars is always so high under the severe stresses which they are compelled to stand that the conclusion of a race brings to light a total list of minor and major troubles which often indicate to the designer what it is permissible to do in ordinary construction.

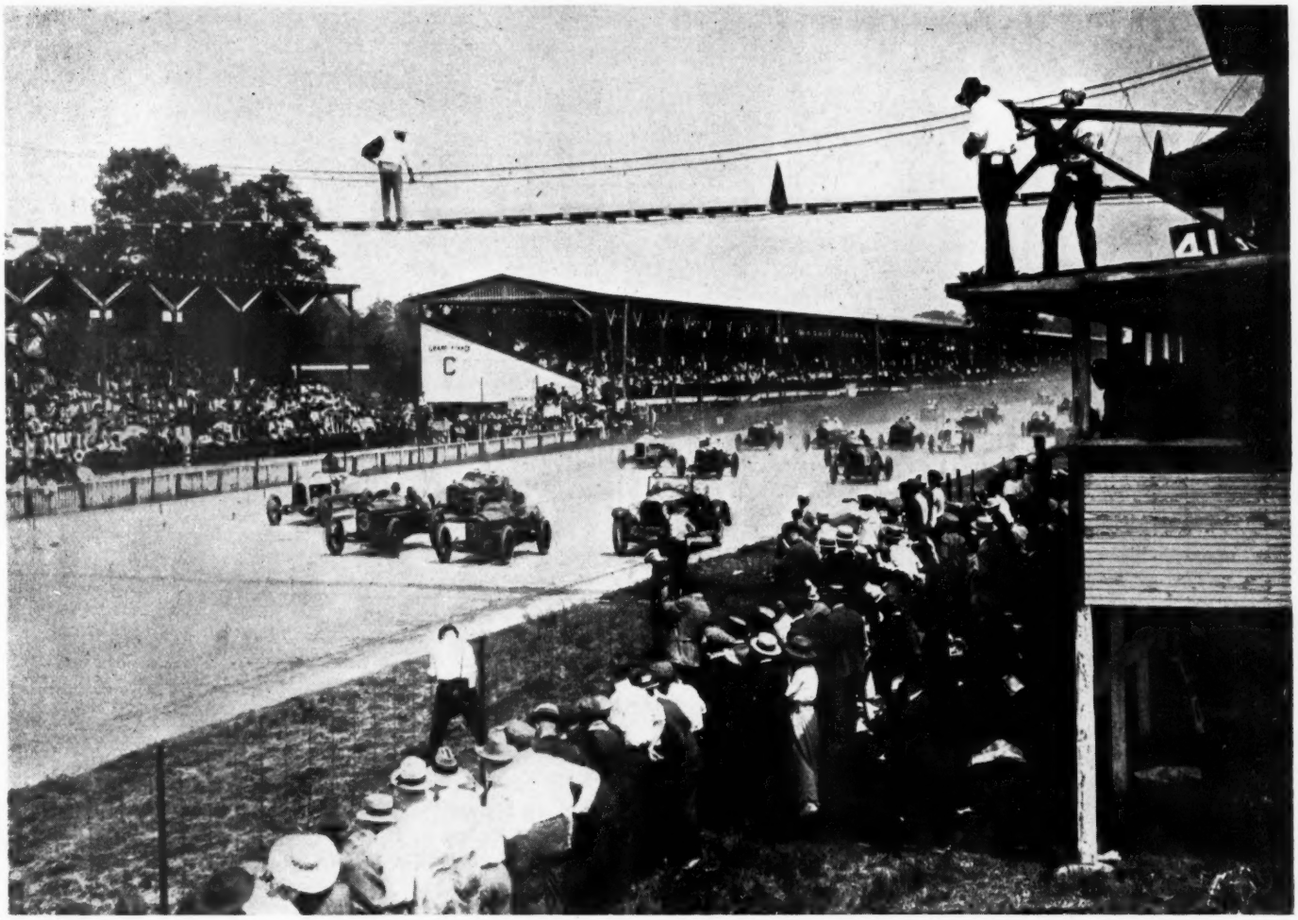
Furthermore, from a theoretical standpoint there is much to be learned in regard to what can be done in the handling of gases at high velocity and what is the limit in allowable piston speeds. Little or no problems of carburetion are, as a rule, apparent, but there is always much to learn in manifold design and, particularly, weak spots in the cooling system are brought to light by the failure of spark plugs and often through the tendency to overheat, as indicated by excessive steaming, etc.

The major number of stops at the pits was directly due to tire failure. This would be expected, as the race was run under a burning sun on a track which was already superheated by two days of exceedingly hot weather which preceded the start of the classic. Sixty-seven tire changes were made. Of this number thirty-one, or nearly 50 per cent, were right rears, which is the usual percentage for the Indianapolis track. Fifteen were left rears, twelve left fronts, and nine right fronts. It would be wrong to assume from these figures that tire performance has not improved. In the first place, probably 30 per cent of the tires were changed before it became necessary, because the cars were drawn up to the pits for other purposes, affording the opportunity to make the replacement. Secondly, the conditions as far as heat and direct sunlight were concerned were never equaled at an Indianapolis race. During practically the entire period the track was in the direct glare of the sun, with no sheltering clouds in sight.

Three cars changed tires six times, these being De Palma's Packard, the Hudson Special driven by Haibe, and the Ballot driven by Guyot. Three cars changed five times; two changed four times; three changed three times and the remainder changed at least once. No car went for the entire distance without a change.



Airplane view of the speedway



As usual, the start was a flying one, J. G. Vincent and Eddie Rickenbacker pacing the pack for a lap and then drawing to one side. This is the end of the paced lap

The winner made only one stop, at which time he took on a complete set of tires as well as oil, gas and water, and he also tightened his shock absorbers. Disregarding this stop, it was the steady running program of Wilcox which won. De Palma and Louis Chevrolet, who proved in the early part of the race that they were the most dangerous contenders as far as actual speed was concerned, had to make stops for failure in vital parts. De Palma had to make adjustments on his valve drive mechanism during his first stop, and on his second stop had to replace an entire front right wheel bearing assembly. This took such a long time that it put him out of the running so far as first place was concerned. While the car was on the track, however, its steady, fast running made it the pace maker, and had it not been for these two mechanical mishaps, De Palma probably would have been the winner. At the 100-mile and 200-mile marks he was in the lead, having broken the speedway record for these distances.

The failure of the Frontenacs showed that they were too lightly built to withstand the stresses imposed by the Indianapolis track. In fact, dangerous weakness was apparent on the rear axle drums. Before the race, on the brake test, the drum on Louis Chevrolet's car cracked under the strain imposed by bringing the car to a stop. This break became apparent immediately the brake was applied. It was on the left rear drum carrier. The right rear drum on the same car broke during the race.

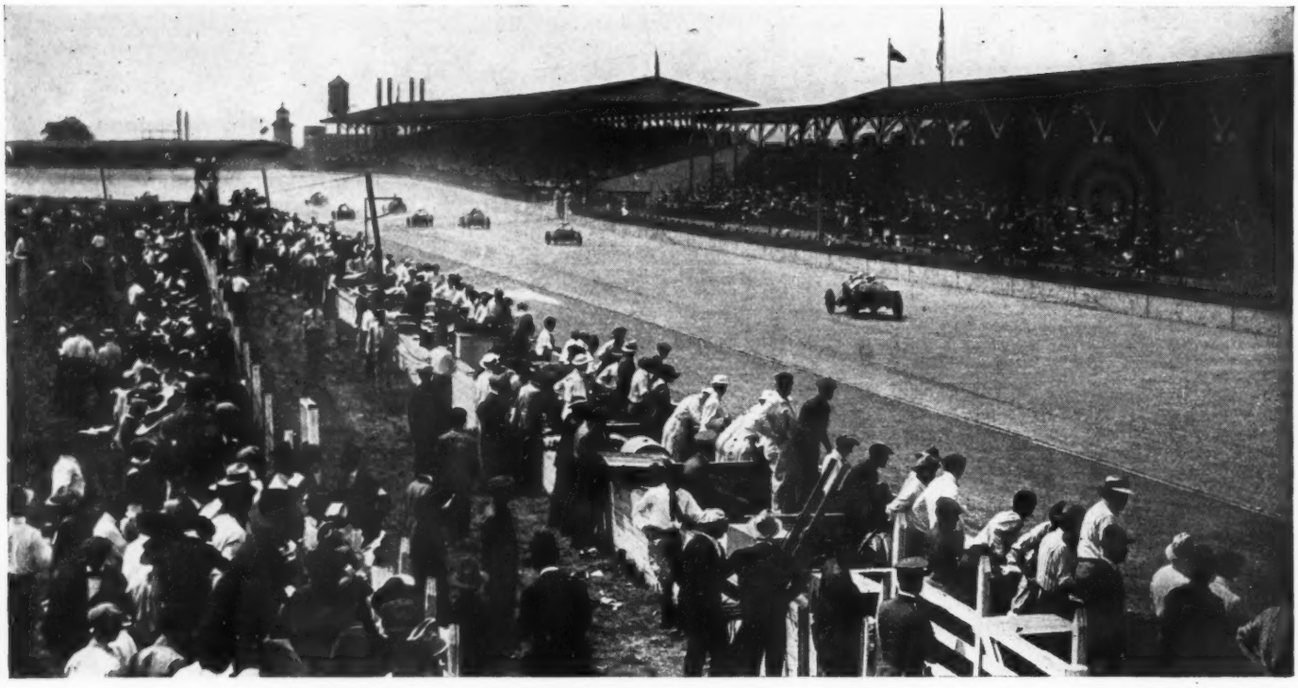
The front axle was also too light, at least the steering knuckle spindle. This became crystallized, due to the continuous bouncing over the rough track, and when the car was on the turn entering the home stretch it broke off, throwing the wheel over the fence, and it was only by the most skillful driving that Chevrolet was able to bring the Frontenac to a halt before his pit on three wheels.

Twice during the race this three-wheel performance was necessitated by failures of the front and rear axles on these cars. The rear axle failures were evidently due to the fact that the aluminum employed was not strong enough to endure the torsional strains resulting from the tremendous acceleration upon leaving the curves.

The Indianapolis track is banked for 90 m.p.h., which makes it distinctly a drivers' track and allows the human element to enter in the management of a car on the turns to a far greater extent than on the 120 m.p.h. New York Speedway. For this reason spark plug troubles are always more apparent on this track, due to the fact that it is necessary to shut off on the turns, allowing the oiling systems a chance to load up before the throttle is again opened. Puffs of smoke are always apparent at the entrances to the back and home stretches, due to the use of the accelerator in gaining speed for the straightaways. It is not surprising that there were twelve stops for spark plugs, during some of which the whole set of plugs was renewed.

The Ballot cars proved a disappointment. While steady, they either did not possess the necessary speed to bring them into prominent position, or else the drivers did not take the same chances on the curves as the others.

The Sunbeams were withdrawn just before the race, and a rumor went around that this was due to the fact



Cars bunched at the southeast turn

that their cylinder displacement was 304 cu. in. and thus beyond the set limit. Investigation has about disproved this, and it is now stated that Resta, in a test drive, found that at 2500 r.p.m. of the engine there was a critical speed at which vibration was so severe that it would have been impossible for the cars to withstand a 500-mile grind. The cars are to be shipped back to England.

There is no doubt that the rough track greatly bothered the Ballot drivers. These cars may show higher speeds in future events than they did at Indianapolis, as there was a feeling before and during the race that they were being held back.

Engineering opinion is growing that 300 cu. in. is too high a limit for cars for the Indianapolis track: it is felt that the limit should be materially reduced in order that racing may be of the greatest possible benefit to the designer. Under present conditions, the cars are so much faster than the drivers (to use a track expression), particularly on tracks like the Indianapolis, that most of the value of the race is lost.

The Duesenberg 4-cylinder, 16-valve engine of 3¾-in. bore by 6¾-in. stroke, was used by O'Donnell (Duesenberg), Hitke (Roamer Special) LeCocq (Roamer Special), Thurman (Thurman Special), and D'Alene (Duesenberg-Shannon Special). These cars showed sufficient speed to put them well up in the race, but owing to the inexperience of their drivers, two of the cars were involved in fatal accidents.

A careful study of the race makes it very apparent that practically all of the cars were much faster than the drivers, which is to say that the cars were capable of developing a speed beyond the limit at which their drivers could safely handle them. This is particularly

Drivers and Specifications of Cars, with Their Equipment

Car and Driver	Cylinders		B. & S.	Pist. Disp.	Valves		Operation	Ignition	Carburetor	W. B.	G. R.	Tires	Plugs
	No.	Cast			No.	Location							
Peugeot, Wilcox	4	Blk.	3.6x7.6	274.6	16	Head	Dual cam	Bosch	Miller	108	2.6–1	34x4½ 33x5	Oleo
Durant, Hearne	4	Blk.	3 13/16x6½	296.8	16	Head	One cam	Bosch	Miller	102½	2.6–1	32x4½ 33x5	A-C
Peugeot, Goux	4	Blk.	3.6x7.6	274.6	16	Head	Dual cam	Bosch	Miller	108	2.6–1	34x4½ 33x5	Oleo
Ballot, Guyot	8	2 Blks.	2 43/64x5 33/64	296.0	32	Head	Dual cam	Ballot	Claudel	108	..	33x5	Doublel
Bender, Alley	4	Blk.	3 5/8x7	289.0	16	Head	One cam	Bosch	Miller	107	..	32x4½ 33x5	Bosch
Frontenac, Chevrolet	4	Blk.	3.87x6.37	299.5	16	Head	One cam	Bosch	Miller	104	..	32x4½ 33x5	Rajah
Packard, DePalma	12	V Blk.	2 11/16x4½	299.2	24	Head	Dual cam	Delco	Zenith	110	..	34x4½ 33x5	A-C
Hudson, Hickey	6	Blk.	3.5x5	288.6	12	L-head	One cam	Delco	Hudson	107.5	..	32x4½ 33x5	A-C
Frontenac, G. Chevrolet	4	Blk.	3.87x6.37	299.5	16	Head	One cam	Bosch	Miller	104	..	32x4½ 33x5	Rajah
Ballot, Thomas	8	2 Blks.	2 43/64x5 33/64	296.0	32	Head	Dual cam	Ballot	Claudel	108	..	33x5	Doublel

All cars carried Goodyear tires. All cars carried Hartford shock absorbers. All cars carried Rudge-Whitworth wheels.

Valve Sizes of Some of the Cars

Car No.	Car	Diameter Exhaust Valve, In.	Diameter Intake Valve, In.	Lift Exhaust, In.	Lift Intake, In.
6	Peugeot (Goux)	2	1	½	½
37	Peugeot (Boillot)	1⅜	1 9/16	5/16	5/16
46	Premier	1 23/64	1 21/64	3/8	23/64
47	Premier	1 23/64	1 21/64	3/8	23/64
45	Peugeot (Wilcox)	1 23/64	1 21/64	3/8	23/64
15	Roamer (Le Cocq)	2⅜	2⅜	⅜	⅜

Most drivers are very secretive about valve sizes. Those given in the table are known to be accurate.

true in those cases where the drivers had had little or no experience in track racing. The Ballot cars may show up better in races on speedways which are banked for a speed of 120 m.p.h. The drivers on the Ballot cars were also too much exposed to the wind pressure. This should be corrected and the seating arrangement should be so changed that the drivers may occupy a more lax position than was possible in the Indianapolis race, where they were notably tense and not at all at ease.

Car Characteristics

Widely differing characteristics were possessed by the cars entering the race. An analysis shows that the winning Peugeot had the highest piston speed of any of the cars. At 87.9 m.p.h., the average speed maintained by the Peugeot in winning the race, the piston speed was 2620 ft. per min., or about 600 ft. per min. more than that of the Hudson, which had about the lowest piston speed of any of the cars in the race. The accompanying chart gives graphically the piston speeds of the typical cars in the race and it will be noticed that the winning Peugeot was considerably faster as regards piston velocity for a given car speed than the other cars.

Considering gas velocities, in the absence of complete statistics on valve areas, these may be plotted on a basis of cubic inches of gas displaced at definite speeds. It is interesting to note that outside of the twelve-cylinder Packard, the winning Peugeot had a lower displacement per minute at any given speed than the other types. This is in spite of the fact that its piston velocity was the highest and is due to the dimensions of the Peugeots, which have a piston displacement of 287 cu. in., as compared with the others, which are close to the 300 mark. The only small displacement car in the race was 150 cu. in., this being the Baby Peugeot with a 2.15 15/16 x 5½ in. engine.

The 12-Cylinder Packard

The Packard 12-cylinder car, which, from its performance on the first 100 miles of the race, was probably as fast as any car on the track, if not the fastest, has only a 4½ in. stroke. Thus, although turning at sufficient speed to give it an intermediate position as far as piston speed is concerned, its position is low on a gas volume basis, and the car probably would show up notably from an economy standpoint were it possible to secure accurate records. Unfortunately, this is not the case, owing to the impossibility of measuring the fuel remaining in the tanks at the conclusion of the race or of measuring the amount put in during the race because of the quantity spilled.

From close observations it appears that the 500 miles were run by the winner on 45 gal. of gasoline. This would give an average of approximately 11 miles to the gallon, showing a high thermal efficiency, as would be expected under conditions of practically wide-open throttle at high speed.

The spark plug troubles were due to fouling more than to fusing, as only little of the latter was seen. The fouling trouble is no doubt the result of the oil-loading due to the acceleration on the turns, as previously pointed out. The only car which showed symptoms of plug fusing due to overheating was car 19, Hudson Special. This car had to change plugs four times and took on water six times, showing that it was badly troubled with overheating. On this same car a sticking valve gave a great amount of trouble.

In studying the reasons which eliminated the different cars, the fact becomes apparent that more failures were due to drivers not experienced on the Indianapolis track than to any imperfection in the cars themselves, although such defects showed up in some instances. The list of eliminations is as follows:

Car No.	Lap	Cause
5	11	Frontenac ..... Burned out rod bearing
39	30	Premier ..... Broken hub
28	9	Baby Peugeot..... Broken rocker arm
2	37	Durant Special..... Broken driveshaft
9	49	Richards Special... Burned out rod bearing
34	45	Ballot ..... Broken right rear wheel
12	57	Duesenberg ..... Burned out bearing
18	44	Hudson Special.... Turned over on back stretch
10	66	Stutz ..... Broken piston pin
33	63	Ballot ..... Ran into wall on back stretch
29	71	Mesaba Special.... Burned out connecting rod bearing
1	55	Durant Special.... Broken steering connection
43	45	Thurman Special... Trouble unknown
36	37	Ogren Special..... Broken oil line
19	70	Hudson Special.... Broken oil line
15	96	Roamer ..... Burned up
22	119	Hudson Special.... Broken steering gear
37	191	McCoy Special..... Turned over on back stretch

While it is almost impossible to tell the cause of accidents such as those which marred Saturday's race, it is certain that in practically every case the lack of experience was one of the main factors.

Minor Troubles Cause Delays

As in all long-distance races, minor troubles were responsible for a great many delays. For instance, one of the Peugeots had to come into the pit twelve times owing to oiling troubles. This car could not hold its pressure and had to draw up to the pit to have the oil pump manipulated at frequent intervals. Trouble of this kind can, of course, be readily avoided if it is foreseen. The same ap-

(*Continued on page* 1245)

Wilcox, the winner receiving congratulations

Co-operation Profitable to Employer and Worker

IT IS not always easy to see the practical application of plans dealing with the question of human relations and containing departures from the general practice.

The questions asked by manufacturers to-day indicate the desire to see results. If the human side of industry had been studied with the care given to the more mechanical elements of production, those questions would not arise so insistently. Under the circumstances, it is fortunate that there are a number of cases in practice which can be reported upon from the results obtained, and the account printed here tells of the benefits to one manufacturer after two years' experience with such a plan.

By Harry Tipper

IN previous articles AUTOMOTIVE INDUSTRIES has explained in more or less detail the organization and form of "employes' representation" plans as adopted by several important American industrial establishments. It will be of interest now to study the results of some of these experiments and to find out just how they work out in actual practice.

A good example of an "employes' representation" plan or "Industrial Democracy," as it is called, is that in operation for the past two years at the tobacco pipe manufacturing plant of Wm. Delmuth & Co., at Richmond Hill, Long Island, N. Y., where 900 men and women are employed.

Leopold Delmuth, president of the company, who considers the experiment a success, says that the plan is "based upon the confidence and co-operation of the whole body of workers." According to Mr. Delmuth, "one of the best features of the plan is that it has succeeded in establishing a happy relationship between employer and employes. It has also helped to produce more and still better pipes."

Profit Sharing an Incentive

Not only does the plan bring about co-operation between the employer and employes in the conduct of the works, but it also provides a means for giving the workers a share of the profits, as the savings obtained under the plan through increased output or reduction in overhead are divided between the company and the employes on a 50-50 basis. The profit-sharing is made effective every two weeks, the employes receiving separate pay envelopes marked "Employe's Dividend." In two years this bi-weekly dividend has never been less than 6½ per cent the wage and it has been as high as 17½ per cent.

Regarding this method of profit-sharing, Mr. Delmuth says: "We believe that profit-sharing is one method, and ours, based upon actual performance of the worker, is another. The profit-sharing plan has many worthy features, but we do not believe that many workmen understand the inevitable variation of the percentage of profit. Furthermore, we do not believe that he should be made to suffer for any losses connected with sales, finances or raw merchandise investments, all of which are beyond his control. Our plan is based upon a saving accomplished by the worker in both production as well as overhead.

"Furthermore, under our plan whereby we give our employe his dividend every two weeks, incidentally in a separate envelope marked "employe's dividend," he does not have to wait for what seems to him the indefinite future to learn whether or not the employer is living up to his promises. He can watch his dividend grow larger or smaller, and soon he will begin to learn that when every machine is running all the time he makes more money than when his fellow workers take holidays and machines are left idle. Thus he comes to know that co-operation means a larger pay envelope."

What's in a Name?

It makes little difference as to what name a plant organization of this kind is given, whether "Employe's Representation" plan, the name applied at the plants of the Colorado Fuel & Iron Co. and the Midvale Steel & Ordnance Co., or "Industrial Relationship" plan, as it is named by the Standard Oil Co., or "Industrial Democracy," the name adopted by the Delmuth Co.

In England the much-talked-of "Whitley Councils" plan of "Works Committees" is of a similar character, except that it goes further and provides for District and National Joint Councils of employers and employes. In America co-operative methods of this kind have been applied only to individual industrial enterprises.

In the Delmuth plant the originators have chosen to give the plan character by calling the representatives, or council, chosen by the employes the "House of Representatives." Carrying the governmental idea of or-

ganization further, they call the council of foremen and heads of departments the "Senate," and they call the sessions of company executives the "Cabinet."

In several of the "employe's representation" plans adopted by other industrial enterprises in this country machinery is provided by means of which differences between the employers and employes can be carried up from the body directly representing the employes to higher and still higher authorities, and finally, if necessary, settled by some form of arbitration.

In the plan used at the Demuth works no provision appears to have been made for arbitration of differences. In fact, if the employes take action contrary to the opinion of the company executives, means are provided by which such action can be "vetoed" by the "Cabinet" or company officials. It is stated, however, that during the past two years the "Cabinet" has never had occasion to exercise this power.

The first question that naturally arises is, "Why did Demuth & Co. feel that it was wise or necessary to inaugurate such a plan in their works?"

Mr. Demuth denies emphatically that the scheme was inaugurated because of labor trouble, or for fear of any. He says they went ahead with it simply because they considered it a wise and liberal, "as well as a paying policy." As he puts it: "When the growth of our business made intimate relationship between the employer and employe impossible, we realized that only through giving the worker his say in the running of the plant could we get the co-operation so urgently needed to further promote business. Hitherto, the labor leader has been the only teacher of the working man, and we knew it would pay us to endeavor to educate the worker in a way that would teach him the value of co-operation."

Effect on Production

As to whether the plan turned out, as was hoped, to be a "paying" investment, Mr. Demuth is equally emphatic in his affirmative, though he says the profit of the plan to the company was indirect, defining his opinion as to the results as follows: "We did not, in the beginning, have any illusion that Industrial Democracy would keep our costs down to pre-war basis. How much lower they have been under Industrial Democracy than they would have been without this plan is largely a matter of speculation. We honestly feel that we have benefited distinctly from this point of view. We are convinced that under the old system we would have had a much more rapidly rising scale of wages, and would have had the difficulties with employes suffered by many other firms, all of which would have increased costs far beyond the point to which they did rise.

"Many of our men are piece workers. Some were in the habit of rushing their work so that they could make the most money regardless of the quality of their output. At the meetings of the Lower House, the representatives of the workers learned that this policy was lowering their dividends, for it was resulting in a large amount of waste. The representatives brought home this fact to the workers, who began to realize that any gain made by rushing their work was more than offset by the loss in dividends caused by this method. Consequently, they soon began to turn out better pipes.

"Another important factor in raising the standard of quality is that, by reason of his having a voice in the management of the plant, the worker takes more pride in his product, as in the case of the craftsmen of old."

Another good effect that the plan has had upon the business of Demuth & Co. has been in the reduction of the turnover. This has gone down to so low a point at this plant that it is no longer a serious factor. During the height of the war, when the high wages of the munitions plants were tempting all workers, and other manufacturers were feeling the shortage of labor, the mutual interests created by the Industrial Democracy plan at the Demuth works kept the men at their jobs. Knowing that lack of help would reduce their dividends, the employes saw to it that their fellow workers stayed.

Before the plan became operative, the employes worked fifty-three hours a week. At one of their "House of Representatives" meetings they voted to reduce the working time to fifty hours. The "Cabinet" did not veto the change, and it became effective. A trial of the new time schedule showed that instead of a decrease in output, the production had been increased 8 per cent.

This change worked out so well that another reduction was made in the working week to forty-eight hours. The company officials admit that this reduction of working time has not decreased production.

How the Workers Like It

At the start many of the employes looked upon the plan with suspicion and doubt, but all now seem to favor it. As one workman reviews it:

"I have seen Industrial Democracy in operation at this factory for the past two years, and the main reason I am for it heart and soul, is because I know that, through it, I can always get a square deal.

"When a man in my department has a grievance, he comes to me and tells me about it, and he knows that I will take the question up at the next meeting of the 'House of Representatives,' and, consequently, the foremen in the 'Senate' and the 'bosses' in the 'Cabinet' will know about it. They will act on it one way or another, and my experience has been that every question has been settled fairly.

"Nowadays at the plant you never hear a foreman urging the men to get on the job. There is no need for it. We all know that by doing our best all the time we are increasing our own dividends. Now whenever a man 'knocks off' early, comes in late or takes a holiday, it is not the boss who wants to know the reason, but the other men and women workers whose dividends he is lowering Before Industrial Democracy was put into effect, it was every man for himself; now it is all for one and one for all.

Things Are Different Now

"Years ago, if a worker had a grudge against the foreman he would probably lay down on the job whenever he thought he wasn't being watched; but that is a thing of the past, for whatever complaints a man has are now quickly settled in a way satisfactory to everybody.

"And another thing, Industrial Democracy has proven that some of our men had, stored up in their minds, ideas for new machinery and other labor-saving devices; but they kept these plans to themselves because they were not sure how they would be received by the management. Now, a man with a good idea knows that not only will his suggestion be welcomed, but that if practicable it will be rewarded. In our plant to-day, labor and time-saving machinery, invented by the men, is lowering the cost, increasing production, and thus earning dividends.

"Industrial Democracy has given us 'a say' in the management of the shop; it has reduced our working hours from 53 to 48 a week; it has given us insurance; it has given us a lunch room where we can get good meals for 20 cents; it has made this shop a better place to work in; it is teaching English to our foreigners and helping them to become Americans; it has taught us that the firm has troubles and worries just the same as we have, and that by working together we all benefit."

German Destruction of the Belgian Automotive Industry

Only One Factory Escaped the Complete Blight, Due to the Use of Plant As Machine Shop—Its Present Capacity Is One Car Daily—Country Likely to Prove New Field for Trucks and Tractors

By W. F. Bradley

THE Minerva automobile factory at Antwerp has as its managing director Mr. S. Dejong, who is of Dutch nationality. It might have been thought that this would have had a restraining influence on the German authorities. Mr. Dejong was under no delusions. He fled to Holland the day the German army entered Antwerp and was not long in receiving an official communication in the name of the German Emperor ordering him to return and take control of the factory.

Taking possession of the Minerva factory in October, 1914, the German forces immediately began to strip it. When the armistice went into effect they had removed 750 machine tools, all the automobiles and stocks of raw material to the value of $1,200,000, on pre-war estimates. Removals were continued until the last moment. On Nov. 11, 1918, boxes were standing in the street labelled for shipment into Germany. The electric transformers were not taken away, for these were required to furnish current for lighting the buildings. They had been numbered and catalogued, however, in view of a requisition. During the last 6 months they were in possession the Germans exacted 1 ton of brass or bronze goods per week. This was the work of the R. O. H. M. A. (Rettung, Ordnung und Hilfe, Militarische Abteilung).

When the Germans departed, there was not a single machine tool in the whole of the Minerva factory. But the buildings were stacked with wrecked German automobiles and automobile trucks, and the refuse of war was to be found everywhere, even on the flat roofs. Two hundred beds had been placed in the factory buildings. There was unmistakable evidence that these had not been used exclusively by soldiers. The filth was indescribable.

When I visited the Minerva factory I was shown a most complete selection of drills, taps and dies, reamers, jigs, etc. The question naturally was asked why this valuable material had been left behind when everything else had been taken away or destroyed.

From the beginning of the war to the middle of October, 1914, when Antwerp fell into the hands of the German army, the Minerva factory had been producing war material. The directors realized two weeks in advance that the city would fall, and in the belief that the war could not last more than 6 months they had all their small tools, jigs, dies, etc., wrapped in oiled paper and hidden in the factory chimney. For 4 years German soldiers leaned against the chimney, within which this valuable material was hidden.

One day they suggested that a fire should be made in this particular chimney. One of the staff remaining at the factory informed them that there had been an accident at an earlier date, and suggested that the fire should be made elsewhere and the pipe brought into the chimney above the obstruction. His advice was taken, and more than 4 years later, when the enemy retreated, this material was found practically intact.

Soon after seeking refuge in Holland, Mr. Dejong began to get machinery together to be used when the war was over. With Belgian refugees he began the construction of 150 lathes. This work was proceeding very satisfactorily, when the German authorities were informed of it and placed Mr. Dejong on the blacklist. The consequence was that no raw material could be obtained, for Germany had practically complete control of this, and that all the Belgian refugees were thrown out of work. Although the lathes could not be finished, work was found for the men by the Dutch Government.

Fortunately American lathes and other machinery were found on the Dutch market, and were purchased in anticipation of a resumption of business. The managing director of

THIS is the second of a series of articles by W. F. Bradley, special European correspondent of AUTOMOTIVE INDUSTRIES, on the destruction of the automotive industry in Belgium. Last week the general situation was graphically described. In this article Mr. Bradley tells of the conditions he found at the various factories. In the big fact that production ability was destroyed in all but one factory the situation is common. But in each factory a different degree of barbarity was practised. Mr. Bradley went to Belgium to investigate the automotive industry for this publication and as its representative he was accorded many special privileges by government officials and leaders in the industry.

—EDITOR.

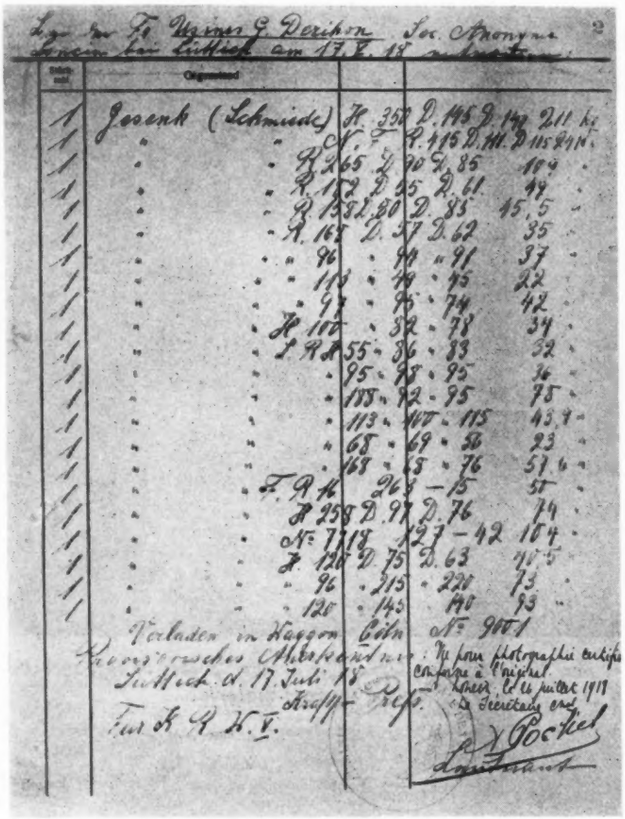
The Exteriors of Two Factories Are Typical of Scores

The Cockerill steel works when the Germans left. The avowed object of this wrecking was to obtain metal to be used as raw material

Shop fittings were ripped out and thrown into the yard. The Germans had no use for wood partitions so left them outside the Derihon factory

the Minerva company was also able to visit America and arrange for the purchase of machinery, to be delivered when the war was over. In consequence of this, the Minerva factory, although stripped bare by the enemy, probably will be in production before the end of the year. At present, repair work is being done for the Belgian Government, while the shops are being cleaned, shafting erected, and machinery laid down.

The treatment accorded to the Nagant company at Liége is an example of rapidity. Before the end of 1914 much of the machinery had been seized. Even at that date a complete organization existed for receiving and disposing of machinery seized in the countries which the Germans had invaded. This business was handled by the E. Sonnenthal company of Berlin. The receipts stated that this machinery was taken on a loan and would be returned later with an allowance of 10 per cent depreciation if kept for more than 6 months and 5 per cent if kept less than 6 months. The Germans fixed the value of the machinery they seized, but the Nagant brothers refused to recognize this price.



Type of receipt given by the German authorities for requisitioned machinery

In early 1915 an engineer arrived at the Nagant factory with a story that he was entrusted with the task, on behalf of the German Government, of protecting the Belgian industry. He suggested that the factory should be turned to work for Germany on non-war materials. The Nagant brothers refused. It was pointed out to them that they were risking deportation to Germany. They replied that they would risk death rather than work for the enemy.

"I shall be obliged, then, to take entire possession of your factory," replied the delegate of the Imperial Government. From that time to the date of the armistice the owners were not allowed to go inside their own factory buildings. Their connection with the plant was limited to one small office, in which they could sit and receive the requisition slips the invaders handed to them. Later they were turned out of this office. They then found a small shop available and began work on an experimental model until this was discovered by the enemy and all further activities stopped.

Robbed of $200,000 Worth of Material

Altogether the Nagant factory was robbed of $200,000 worth of machinery and automobiles. Notwithstanding the close scrutiny, it was possible, in August, 1914, to hide a number of automobile parts, and efforts are now being made to get together sufficient machinery to assemble these into complete automobiles.

Throughout the entire period of occupation, the Belgian people displayed an indomitable spirit. They refused to help the enemy in any way whatsoever, and although open defiance was generally unwise, they frustrated to the limits of their power all the efforts of Germany to obtain material.

The Excelsior Factory

The directors of the Excelsior factory, at Saventhem, a few miles out of Brussels, made desperate efforts to keep their plant in running order to provide a livelihood for their workpeople. The argument was used that if the machinery were taken, the men would be thrown out of employment and starve. The directors contended that all machines were used all of the time. In order to carry out this deception, a warning bell was placed at the main door. When this bell sounded, every machine within the building was set into motion and kept running until inspectors or other visitors left the factory.

This deferred the calamity, but it soon became evident that it could not be averted. Very early during the occupation, 60 automobile tires and a large quantity of copper, brass and aluminum were hidden in the base of a chimney of a nearby factory belonging to a neutral who had fled the country. After 4½ years the tires were ruined, but there was the satisfaction of knowing that Germany had not been able to get them.

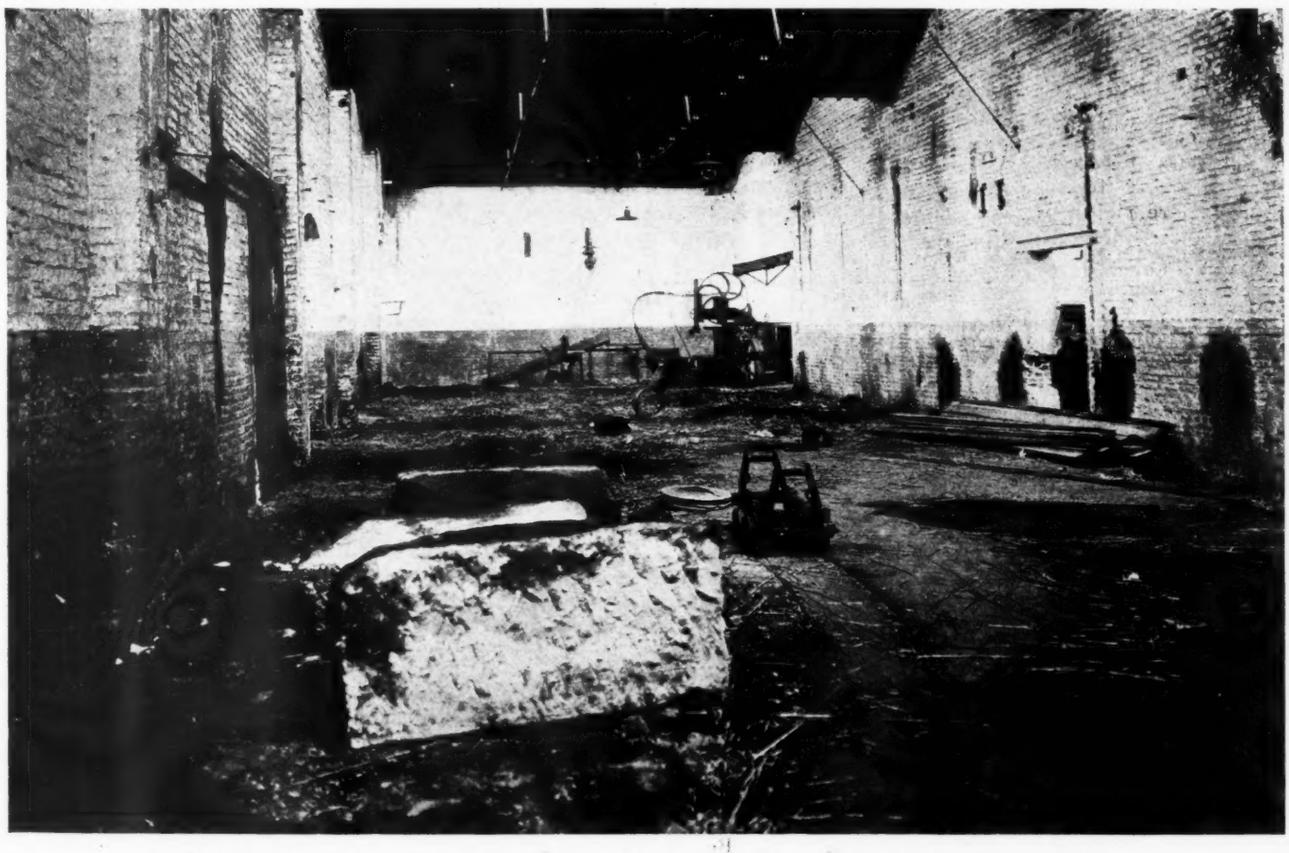
Many automobile parts and essential parts of lathes were loaded on a wagon and with the help of a forged passport were carried into Brussels and buried. This trip was made at least a dozen times over a main road closely guarded by German troops, who stopped every passerby and had the right to search whomever they liked. The men who made these trips had to pass the spot where Edith Cavell, and other victims of German barbarity, had been shot and buried.

The first lathes were taken from the Excelsior factory in April, 1915. The main removal began at the end of 1916, when the company lost everything but the hidden parts. The method of giving receipts at the Excelsior factory was very loose. In many cases a mere slip of paper, stating "one lathe, one drill press," etc., without details, without price, without signature, was all that the company obtained.

De Coninch, the Excelsior engineer, was resolved that no work should be done in his plant for the benefit of Germany; also that he would frustrate every attempt of the enemy to destroy the Belgian industry. Unable to produce, he spent practically 4 years experimenting on automobile designs. In a tiny shop concealed from the enemy, he produced a new rear axle, a gearset, suspension, and braking system and got out designs for a new type of over-head-valve engine. It was obviously impos-

Machine Shops Little Resembled Well-Fitted Workrooms

The hole in the center of this picture shows where the drophammer foundation was dug up. The hammer which featured this shop was taken to Germany



The machine shop. The stone blocks in the foreground were foundations for machines

sible to build a complete car, for the parts had to be hidden as finished. Nevertheless, all the essential parts of the two axles, the springs, the gearset and the brakes, were finished, and on the occasion of my visit to the factory I was given an opportunity of testing this roughly made experimental car, which is really remarkable in many respects. The greatest difficulty of the firm is that it has no means of production.

This experimental work was carried on in complete ignorance of what was happening in the outside world. The only technical information Mr. De Coninch received from the outside world was from an occasional copy of *Motor Age*, smuggled into Belgium through Holland.

Pipe, one of the leading Brussels firms, built armored cars until the day the German army entered the capital. When the invaders left, after the armistice, not even a file or a punch could be found in the Pipe factory.

The value of the stolen machinery is $700,000 on 1914 evaluation.

In addition to this practically all the patterns for the pre-war models have been destroyed. Unable to produce, the firm is now doing automobile repair work for the Belgian Government. Some of the stolen machines have been traced. They are as far apart as Zeebrugge, Turkey and Bulgaria. New machinery cannot be found in Belgium. Only a few days ago a man was sent out, with cash in hand, to bring back a few forges. He returned with the money in his pocket. Pipe estimates that it will be impossible to begin production in less than 15 months.

One of the finest engineering establishments in Belgium before the war was the Fabrique Nationale, at Herstal, near Liége. Being a small-arms concern, it is not surprising that the Germans treated it with severity. After having refused to work for the enemy, the managing director was deported to Germany, where he remained 4 years. The drop hammers were the first to be requisitioned, but in 1915 the whole plant was seized and every Belgian connected with it was turned out. Of the 3800 machine tools possessed by the F. N. in 1914, 3600 have been seized or destroyed. The remainder had all been listed for removal and would have gone into Germany if the war had continued another two weeks.

The total value of the material and machinery seized is $6,000,000 on a 1914 valuation.

Not more than one-fifth of this machinery, however, was used for the manufacture of F. N. automobiles, motorcycles and bicycles. Receipts were given for all material taken away, and the valuation was fairly reasonable.

When they made these seizures, in 1915, the Germans appeared to be of the opinion that they would certainly win the war, and that they could afford to act generously. After all, it cost them nothing, for not an ounce of seized material has been paid for, and all that the Belgian manufacturers have are scraps of paper of doubtful value. As in all other factories, the F. N. management is convinced that the seizures were made more to destroy a competitor than to get machinery and metal. Some of the first machines removed were handled with care, but the great majority of the tools were handled in such a way that they were seriously damaged before being taken out of Belgium.

Toward the end of the war there were a great lack of discipline and a considerable amount of pilfering by German soldiers. The men stole magnetos and sold them to their own government. Most of the glazed bricks in the walls of the engine room were stolen by the German soldiers and sold to the German army. Just before the armistice went into effect, and immediately afterward, the soldiers offered to sell good touring cars for $100 each. In several cases, stolen F. N. cars were offered for sale by German soldiers to managers of the F. N. company.

One of the German engineers (unidentified) responsible for the destruction of the Belgian automotive industry

This photograph was obtained without knowledge of the German authorities

When the German army moved across the Rhine, in November, 1918, the F. N. factory contained 200 machine tools, all of its gas engines, with the exception of one which had been wilfully damaged, the complete electric lighting installation, but no electric power equipment, and 426 German trucks in a more or less damaged condition. The buildings were not injured otherwise than by neglect.

At the present time, instead of its original staff of 4000, the F. N. is running with a staff of 1500 workpeople, who are engaged in repairing and replacing machinery and shafting and repairing abandoned German automobile trucks and staff cars. The tools left by the Germans have been united in one of the shops and are being used for repair work and for motorcycle construction. It is intended to produce first motorcycles and touring cars.

While F. N. makes little complaint about the German valuation of seized goods, the Van Den Plas body works at Brussels reports a curious case of robbery. This company had in hand 12 Rolls-Royce and an equal number of Sheffield-Simplex chassis, sent from the factories in England to have high-class bodies fitted. These were requisitioned at 4800 marks (approximately $1,200 each), although the market value at that time was $5,000 and during the war rose to nearly double the value—$9,000.

In answer to a protest the German authorities stated that in their opinion 4800 marks was all a Rolls-Royce chassis was worth. Notwithstanding the lower valuation, there was intense rivalry among the higher German officers for the possession of these cars.

In a very few cases the factories were requisitioned and made use of by the Germans for their own purposes for practically the entire period of the war. In such cases the damage inflicted was naturally less. The Metallurgique factory was treated in this way, being used as a central repair depot for the automobile service of the German army. Some machines were removed, but sufficient were left behind for the factory to be in a position at the present time to produce one car a day.

The Germain factory, on the other hand, was completely burned, while Springuel has sustained such losses that it is doubtful if the firm will be revived.

When Louvain was sacked in August, 1914, the Dyle & Bacalan factory was razed, thus depriving Belgium of practically its only automobile frame producing plant. The difficulty of obtaining frames is so great that the

Stockrooms Often Were Used as Stables and Piggeries

This stockroom of the Derihon factory was typical of factory stockrooms in Northern Belgium on Nov. 11, 1918

Even the papers and books left in this Derihon stockroom were made useless

firm has placed orders in America, and in the repair shops broken parts, which normally would be thrown away, are patched in a most unusual manner.

The entire situation is full of difficulties for the Belgian automobile manufacturer. Fully 90 per cent of the machinery is gone. Some of it has been removed to Germany, where it is being identified with the greatest difficulty. In many cases it has been completely destroyed. The manufacturers hold German receipts which, in many cases, describe the material in the vaguest manner, and in other cases give to that material a ridiculously low valuation. It is reported that the Belgian Government will shortly make an advance of 50 per cent of the value of the machinery seized; but in view of the increase in price of all material this will not represent more than 25 per cent of the present value.

Germany Should Make Good the Losses

Obviously Germany should completely refund these manufacturers and be made to return every machine that can be found.

In consequence of this condition, it is not surprising that some of the smaller manufacturers should be disheartened and should be questioning the advisability of continuing in the automobile industry. A majority of the manufacturers, however, refuse to admit themselves defeated by the Kaiser. In place of money they hold bits of German paper; the exchange rates are high; raw material is scarce; manufactured goods are hard to obtain; workers have been killed or have emigrated and those remaining are asking for working conditions equal to those of England and France. It will take at least a year to equip the factories and, in the meantime, foreign automobiles can be brought in under the pre-war tariff and France, England and America are likely to get the export trade that Belgium formerly held.

An effort is being made to induce the Government to raise the import duties from 12 per cent to 45 per cent. This proposition, however, is strongly opposed by Belgian dealers, who realize that they can only obtain foreign cars for a full year.

Undoubtedly the first firm to produce will be Minerva. This company is working hard on reconstruction and has already brought to the factory the machinery that was purchased in Holland and is beginning to receive the machines ordered from America.

While the war was in progress new designs were prepared. There are to be two models, a four and a six cylinder, each with a Knight engine, 90 by 140 mm. Among the improvements are electric lighting and starting, cantilever suspension, and spiral bevel gears in the axle. Although only high-grade cars are to be built, the demand is so great, both in Belgium and abroad, that Minerva estimates it will be fully 2 years before production will overtake demand.

Metallurgique will be early in production.

Excelsior Has Designs Ready

Excelsior has designs all ready for a very interesting new model, but is experiencing great difficulty in getting machinery with which to build it.

Most of the other firms are in such difficulties that they are glad to continue repairing army trucks and cars while getting together the necessary plant for the production of automobiles. Even if they could, by some miracle, obtain all their old machinery, they would not immediately be in much better condition, for foundries and forges throughout Belgium have been destroyed as thoroughly as the automobile factories.

Notwithstanding these difficulties, it has been decided to hold an automobile show in the Cinquantenaire Palace next December. This building, one of the finest in Brussels, was used by the Germans, for 4 years, as the headquarters of their Motor Transport Corps.

Before the war there was only one automobile truck manufacturer in Belgium, and very few trucks were in service. This was because the country was so well provided with light railroads that road transportation was at a disadvantage. Now there is an increased interest in trucks, and the Belgian representative of the English Austin company reports that he is delivering 30 3-ton trucks a week.

The Tractor Future

Before the war the horse-breeding industry was so extensive in Belgium that there was no room for the farm tractor. During the occupation of Belgium, the Germans did their best to transfer the horse-breeding industry from Belgium to the east of the Rhine, and they appear to have succeeded to a wonderful degree.

Thousands of draft horses were stolen and sold in Germany. In the city of Cologne alone, 6,800 Belgian horses were sold and the profit of 3,694,847 marks paid into the German war chest.

Dr. F. O. Waldmann, writing in *Der Rheinische Bauer*, of Feb. 2, 1918, stated that before the war Belgium exported 30,000 horses per annum of a total value of about $10,000,000. He cynically stated that by reason of the activity of the German Government the Belgian horse-breeding industry had been ruined to such an extent that for a number of years Belgium would not only be unable to export, but would have difficulty in meeting her own requirements. Germany, on the other hand, is in an excellent condition so far as horse breeding is concerned.

Because of these conditions, the Belgian engineers are turning their attention to the agricultural tractor. It has been decided that the first tractor demonstration shall be held in the fall near Termonde; it is doubtful, however, if any but foreign machines can be presented.

(*To be continued*)

British Aircraft Standardization

DURING the past year and a half the British Engineering Standards Association has been responsible for the preparation of all specifications for aircraft materials on behalf of the Department of Aircraft Production. During this period some 70 standard specifications for aircraft materials were issued, and a further 60 were practically complete at the time of the cessation of hostilities. These specifications were distributed to the makers by the department, as the whole of the British aircraft production was under its control. These conditions are now changing, and at the request of the Air Ministry and the Department of Aircraft Production, the British Engineering Standards Association has been requested to continue the preparation of specifications for aircraft materials and parts, as well as undertake their distribution, together with the issue of manufacturing instructions and notes on testing procedure which were formerly prepared and issued by the Technical and Inspection Departments of the Department of Aircraft Production. The request has been accepted.

It is proposed to reorganize on a peace basis the various sub-committees concerned with the preparation of these specifications. These sub-committees, when reorganized, will undertake the revision of the specification for peace purposes. In the meantime all the 200 specifications in use by the Department of Aircraft Production have for immediate purposes been adopted as interim British standards. A small charge is to be made for the standards sheets, either 2 or 3 cents per copy.

The FORUM

Follow-Up System for Engineering

By John Younger

IN reading over AUTOMOTIVE INDUSTRIES for March 6, I was interested in noting the follow-up system for engineering, described on page 539.

Without in the least way taking from Major Kalb the credit, I would point out that this particular system was away back many years before this, and is really a development of the control board, which I believe was first of all suggested by the late Dr. Fred. W. Taylor.

When the Pierce-Arrow Motor Car Co. was working on a truck to follow the May, 1917, Army specifications, the matter of getting the work through the drafting room quickly was taken up between Mr. Davis, Mr. Seelbach and the writer at the plant, with the result that we put in a control board in the drafting room, on which, first of all, a very close approach to the Bill of Material for the truck, item by item, assembly by assembly, was printed, and we then assigned a special man, whose sole duty was to go the rounds of the draftsmen and find out in exactly what state his subject was. These lines were run on progressively by this control board, which was nothing more or less than a calendar chart, so that the status of each particular subject could be immediately determined. This was carried out still further by also marking on this the progress of patterns, ordering of dies, etc.

It might interest you to know that the installation of this control board actually allowed us to design this complete new truck and get the sample through in ten weeks, which is, I believe, as fast as the Class B truck was gotten out.

This system was also introduced into the Engineering Division, Motor Transport Corps, and Major Kalb improved on it because of the large number of different jobs that we had by giving a summary for executive use.

There is no question but that this system is of tremendous value.

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Military Truck Discussion

By A. P. Brush

IT is affirmed that a specialized non-commercial type of truck for military use by the United States Government has been, is and *must* continue to be a military and economic liability for the following several reasons:

As to the last war period, the designing and experimental work on the B truck and the Militor was an economic liability to the country because that work diverted a very considerable amount of expert talent from other occupations at a time when there was a critical shortage of such talent.

This work of designing and all of the experimental and production work on the B truck and the Militor were a military liability because the military forces of the country needed trucks in quantities taxing the maximum truck-producing capacity of the country, and the introduction and development of new types of truck construction at that time reduced the truck-producing capacity of the country out of all proportion to the possible service of the specialized constuctions to our military forces.

These specialized truck constructions were a further military liability in that they involved the maintenance of an additional set of parts and supplies and the familiarity of the military operating personnel with the care and operation of an additional type of construction.

The continuance of a specialized non-commercial type of truck construction for military purposes will, in the future, be a military and economic liability to the country for the following reasons:

It is an undebatable fact that, in any war emergency calling for a considerable portion of the potential military strength of the country, the need for trucks will of necessity be on a scale which will tax the total truck-producing capacity of the country.

Neglecting for the moment any consideration of the excellence or lack of excellence of a specialized non-commercial military truck design, it is a fact that no type of truck construction differing from that already in production can be substituted throughout the truck-producing plants in the country without a disastrous, temporary reduction in the production rate at a time when national safety demands the maximum.

Since any serious war emergency in the future will compel the use of a commercial truck chassis for military purposes, familiarity with the use, care and capacities of commercial truck chassis by the military operating personnel is almost, if not quite, a military necessity.

The exclusive use of a specialized non-commercial military type of truck construction in peace time will prevent the military operating personnel from becoming familiar with the operation, care and capacities of commercial truck chassis types, and such standardization is, therefore, a military liability even in peace times.

The standardization of a non-commercial specialized type of truck chassis construction for military purposes will effectually prevent the proper development of commercial truck chassis construction toward military adaptability, and such standardization is, in this respect alone, a sufficient military liability to stamp any effort at such standardization as the epitome of military folly.

It is the duty of the Society of Automotive Engineers to recommend to the Government of the United States that each year a competitive test of commercial truck chassis be held for the purpose of determining the military value of the different commercial truck chassis, and base upon the result of such test the purchase of an annual supply of truck chassis from commercial sources for the needs of the peace-time military establishment.

This policy will stimulate progress in truck-chassis adaptability to military needs, and if carried out will be of incalculable value in any future military emergency.

The policy outlined and recommended will further stimulate the development of the truck chassis in ways to make the truck production of the country of additional economic value. It will keep the military operating personnel familiar with the care, operation and capacities of the types of truck chassis which must be used in any large military emergency. It will keep the military authorities in more intimate touch with the commercial manufacturing establishments upon which the military forces of the country must rely in an emergency, and will insure a better liaison between the military authorities and the commercial interests of the country than existed during the past war emergency.

On the other hand, the proposed standardization of military truck chassis construction will mean an unjustifiable stagnation in truck chassis development both for military and commercial purposes. Such standardization will also insure a dangerous ignorance on the part of the military operating personnel regarding the use, care and capacities of commercial truck chassis.

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Molybdenum in Steel

UPON the outbreak of the war the price of molybdenite suddenly rose in a remarkable degree, apparently because Germany bought it in quantity as a substitute for tungsten. During the war both England and France found themselves short of tungsten, and they, too, had recourse to molybdenum in the production of high-speed steels. Steel companies were parties to large contracts for molybdenum; but before the steel was actually put to use, the war ended.

Good Tractor Prospects in Peru

Slow-Moving Ox and Crude Plow Being Supplanted—Fuel Question Serious—Motion-Picture Advertising Effective

By A. C. Shumway*

THIRTEEN Fordson tractors are in daily use in and around Lima and one in Chimbote, a valley north of Lima, a day's run up the coast on a steamer. This latter tractor is at work on one of the estates of the President-elect of Peru, whose family owns numerous haciendas, and who will probably purchase many tractors.

In connection with the plowing, only one difficulty has been encountered, and that is that when the plow becomes worn, the point has a tendency to throw the plow upward instead of downward, and this trouble cannot be overcome by altering the attachment of the plow to the rear of the tractor. The only remedy is to attach a new plow point.

The small parcels of land, running from 7 to 20 acres, require a tractor that is easily handled and has a short turning space. With the Fordson type of tractor it is possible to negotiate most of the small irrigation ditches running lengthwise of the field, and very often it is possible to plow out an old irrigation ditch so as to level up the field.

The tractors evidently receive terrible handling on the way down here. Out of the fourteen which have been received, two arrived with the radiator top tanks broken, and the drawbar cap and foot bracket were also broken. The cases that the tractors came in were in terrible condition when they reached here. One tractor had the four sides and top completely separated from the bottom, and out of the fourteen tractors, ten had their tools taken away and one had the crank handle stolen from the crate.

Fuel Question

The question of fuel is serious here at present, on account of the very high price of gasoline, gas oil and kerosene. Although we have our own oil fields here in Peru, at Lobitos and Negritos, the price is out of all reason. It seems that Messrs. Milne & Co. have a contract with the London & Pacific Petroleum Co. that has 2 years more to run, and they claim they have to charge the price they do on account of the lack of tin cans and boxes to bring the fuel down in; they also claim that the retail dealers are to blame for the high price.

Mr. Montevon has recently taken charge of the business of the London & Pacific Petroleum Co., and I am trying to see what arrangements can be made to have the oil sold in steel drums to consumers. If this can be done we would get away from the box and can business.

The prices change almost weekly, according to the supply here in Lima, and to-day the retail prices are:

Gasoline, case	1.200	equal to	$6.00 Am. cy.
Gas oil, case	.950	equal to	4.75 Am. cy.
Kerosene, case	1.000	equal to	5.00 Am. cy.
Medium cyl. oil per gallon	.250	equal to	1.25 Am. cy.
Heavy gear oil per gallon	.250	equal to	1.25 Am. cy.
Grease per pound	.060	equal to	.30 Am. cy.

The foregoing prices are for goods in quantity; prices are considerably higher the farther away from the coast one goes. I am now endeavoring to see what can be done to get a good grade of the above placed here at a lower price.

There are quite a number of oils on the market here, as many of the larger houses carry several agencies of oil companies in the States, and they are pretty well represented through the Republic in the smaller towns. From inquiries I have received I judge that they are alive to the situation, realizing that there will be a considerable demand, and they are going after the market, so I do not think that the cylinder oil question will bother me.

I have sent a good man out with each machine of the present lot, so as to break in the help available on the different haciendas. The men stay sometimes a week and sometimes 2 weeks. There has been no trouble whatever along that line, and I must say that I am surprised at the way that the cholos have taken to the machine.

One of my strongest selling points has been that the machine could be run by the most stupid cholo, for all the other machines down here need mostly a good mechanic. As yet they have handled them splendidly, and when parties come in to have me take them to see the machines working, it always impresses them to see the way that the common help take hold and control the tractor, just as if they had been used to it all their life.

Labor Difficulties

The labor question here in the country is a very difficult one, and the tractor relieves about fourteen men, for one Fordson here is doing the work of from twelve to fourteen men, mostly plowing from seven to eight acres a day of 8 hr.—work which requires twelve to fourteen yoke of oxen, and a man for each yoke, and then the ground is far better plowed than with the oxen.

Upon the arrival of the next lot of tractors, I will send up men to the different agents, so as to set up and deliver the tractors to them. The men I break in here, on one or another of the haciendas near me, for they are all friends and are pushing the sale of the tractor just the same as if I was paying them to do so. One good point about the South American is that he is all with you or all against you.

The moving picture was and is a great success. The first time it was shown I hired the best theater in Lima, advertised for 3 days in the papers and sent out special invitations to the people interested. I furnished them with music and had a good-sized crowd. They were very much interested, as this form of advertising was entirely new to them. The film is now being shown by contract all over the Republic through some forty different picture houses, and I have received many congratulations from different parties on the splendid advertising it is giving.

Best Advertising Method

The Spanish folders I am sending to all of the agriculturists by mail, and my sub-agents are doing the same, so we will be sure to reach them all.

The best advertising is the work that the tractors are doing here around Lima, for all the Peruvians come to Lima, and at the hotels and cafés they meet and tell their troubles and what they are doing. In this way the fame of the tractor has been spread all over the country. Besides, my agents are busy, for from the letters and telegrams I have received from them I know that the tractors that are to arrive are just about disposed of, and before you receive this letter I will probably have sent in another order larger than the last.

As the business increases, I will eventually have a dealer for each of the valleys, but for the present my representatives are those given in the following list:

Paita & Piura, Graham Rowe & Co., Piura.
Eten & Chiclayo, Vda Russo Y Hijos, Chiclayo.

*Mr. Shumway is a Fordson dealer in Lima, Peru.

Salaverry & Trujillo, Sr. Tomas Morante, Trujillo.
Pacasmayo, Sr. Tomas Morante, Trujillo.
Cerro Azul, Canete, Sr. A. E. Romero, Canete.
Tambo Mora & Chincha, P. O. Macera, Chincha.
Pisco & Ica, Nazco, Palpa, G. Badaracco, Pisco y Ica.
Mollendo, Arequipa, Cuzco, C. Arenas Sucs., Arequipa.
Huancayo, Chas. Guislain, Huancayo.

I am now sending a man down through the lower valleys around Mollendo and Arequipa, taking in Cuzco, to see what he can do with the tractor, and to place other agencies where needed, for I do not want Arenas of Arequipa to lose any business on account of having too much territory. Up to the present the amount of business there has been almost nil, it being somewhat different from the rest of Peru.

We have some haciendas along the coast where the disc harrow cannot be used to advantage, on account of the very great number of stones of all sizes. I have seen them plow through a huaca that they were trying to get rid of where no one in the States would think of plowing.

Full of Stone Heaps

The Indians in the time of the Incas and for thousands of years before had the habit of clearing off the best land by placing all the stones in a heap somewhere in the field, and so Peru presents a different appearance than most countries, for many times these huacas cover an eighth of an acre and are high in comparison; the fields that I have mentioned as not using the harrow are places that the Indians could never have cultivated, for they would have piled the stones in heaps. Often they covered these heaps of stones with their fortresses and buildings made of adobe, which still exist everywhere.

The Indians numbered about 10,000,000, against 3,000,000 inhabitants to-day, and were an agricultural people, building their large heavy adobe forts and fortifications in all the valleys, the ruins of which still exist. They had a wonderful irrigation system, and coming down the valleys you will see way up the mountain sides the irrigation ditches—ditches that would do credit to a modern engineer, and must have taken thousands of Indians years to build. It may interest you to know that the potato and tomato are supposed to have come from Peru.

The natives here, when they plow with the pointed stick and oxen, so as to open up the furrow wide, always tie two horse or burro skulls on opposite sides of the plow. They prefer the burro skull to the horse skull, as the bone is harder and lasts longer.

There is a wonderful outlook for the tractor in Peru. The requirements are that it should be simple and strong, have plenty of power, be easy to run and need little attention in comparison with others on the market. The Fowler has always been the favorite here, but the cost is about $30,000 American currency, I understand; it plows about the same amount as the Fordson, but can go 14 in. deep if needed. There are two steam machines, one at each end of the field, which are connected by cable by which they pull a heavy plow or harrow. They require a horse and car to bring the water and wood for making steam, requiring ten or more men.

[In addition to the fourteen tractors mentioned in the Peruvian dealer's report digested above, the export concern of Fordson has just shipped forty-nine more to five ports in Peru. Good business is expected from this country, as considerable farming is done on all-irrigated land, and all of the work is done with the slow moving ox, as mentioned in the report.—EDITOR.]

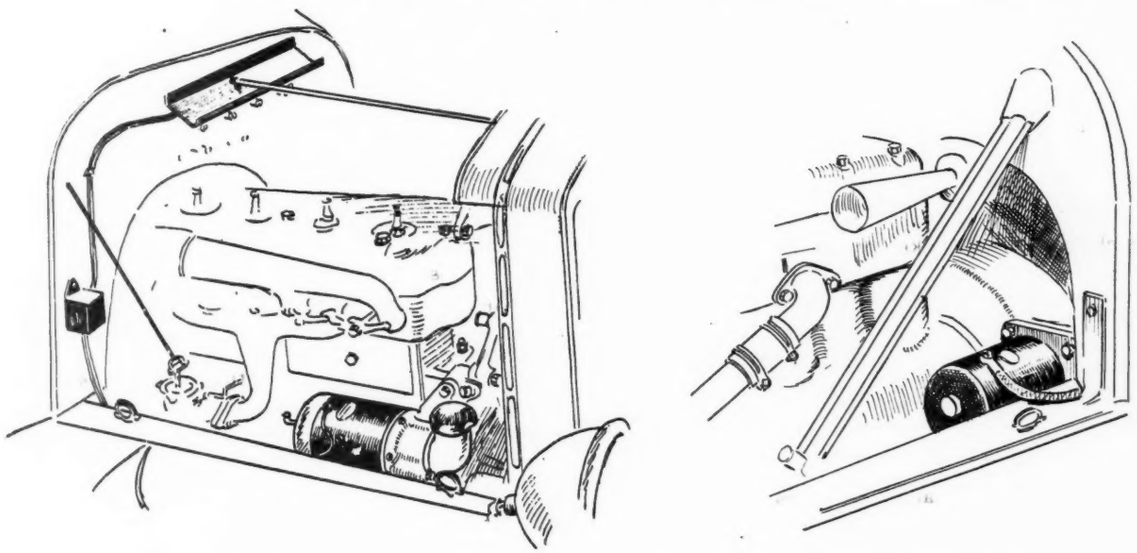
Hayne's Wearever Runningboard

THE process of rolling linotile and similar products upon board is being introduced as a means for runningboard construction by J. T. Hayne of Buffalo, N. Y. This process comprises the molding of linoleum or rubber tile on wood to the exact size of the runningboard.

The wood has on its surface numerous holes or grooves, with their walls slanting inward, into which the material is forced. This anchors a thin layer to the base and makes it impossible for it to bulge, as often occurs with the ordinary methods of laying linoleum.

Instead of a foot pad fastened to the step with several screws, it is possible with the Hayne type of runningboard to mold the foot pads into the design. It is also possible to mold into the design monograms or any other markings desired on the car, making it a factor in theft prevention as well as identification.

Installation of Liberty Starting-Lighting Equipment on New Fords



These two views show the location of the generator (left) and the starting motor (right). Both are quite small and have been built into the Ford assembly in an inconspicuous manner. The left view shows the addition of a rain gutter over the coil to prevent short-circuits caused by rain coming through the hood hinges and between the hood and cowl

Gear Steels*

Classification of Gears According to Application and According to Materials and Treatment—Properties of Gear Steels—Methods Employed in Carbonizing and Heat Treatment

By Dr. J. Heber Parker

FROM a commercial standpoint gears may be divided into three groups: Gears for automotive service; gears for electric car service; and what may be called commercial or jobbing gears.

Gears for automotive service include those used for automobiles, both trucks and pleasure cars, airplanes, tractors, motor boats, machine tools, etc. Upon gears of this group there has been devoted a great deal of study and work as regards different types of analyses and the heat treatments for each type, and also the matter of design as applied to the metallurgical side of the question, such as minimizing the matter of warpage in hardening, etc. In fact, it may be said that the story of the development of gear steels for automotive work is in great part the story of the development of alloy steels of the last 15 years with which the writer has been closely connected.

Case-Hardened and Tempered Gears

Steels for this work are divided into two groups: Steels for case-hardened gears, where there is a hard surface and soft core, and steels for tempered gears, where there is uniform hardness throughout the entire tooth section. Much has been said about the relative merits of each group. It is a long story and may be passed over by expressing the opinion that, in a general way, each has its own special field, the case-hardened gears for constant-mesh service, and the tempered gears for change or clash-gear service. Certainly the tempered steel clash gear does not realize the experience of the case-hardened gear in the same service, when hard, case-hardened clash faces are chipped off with the resultant exposure of the soft core, and consequent trouble with bearings impregnated with hard steel chips. Tempered gears have sometimes been criticised on account of pitted tooth surfaces which were found after limited service. It is believed that this pitted condition is caused by excessive unit tooth pressure due to several causes. A few experiences where the condition of pitted surfaces was corrected may be of interest:

First.—Misalignment of gears was believed to be the cause of the trouble, thus throwing an excessive load upon only a part of the tooth and vastly increasing the unit tooth pressure. When the gears were properly adjusted and the load properly distributed, pitting disappeared.

Second.—A little lower drawing temperature after hardening, which resulted in an increase of about five points in scleroscope hardness, eliminated pitting. The slight increase in hardness was sufficient to enable the gear tooth to withstand the unit tooth pressure put upon it.

Third.—The horsepower of a car had been changed without any change in the transmission. The pitting which occurred was eliminated by increasing by one-eighth inch the length of the tooth face. This increase resulted in decreasing the unit tooth pressure to a safe figure. Properly case-hardened gears, which have a scleroscope hardness of about 90, will undoubtedly withstand, without pitting, unit tooth pressures which will give trouble in the case of a tempered steel gear which is about 75 scleroscope hard. The case-hardened gear, however, is not as tough nor as strong, and in clash service has the disadvantages mentioned above. The tempered gear also will warp less in heat treatment than the case-hardened one, for it reaches an elevated temperature only once in heat treatment, and that for only a few minutes, as compared with the long high heat for carburizing, and two subsequent elevated hardening temperatures for treatment after carburizing.

Six Grades of Case-Hardening Steels

For automotive work case-hardened steels of six types are generally used, three of the types quite commonly, while the other three have a more restricted use on account of their higher cost with, perhaps, a little more careful heat handling requirements. Following you will find a table giving type analysis of each, together with the physical properties of the core, when properly heat treated, which may be expected when these steels are made by mills having more of the quality than a tonnage perspective.

The physical properties given in the table were secured by treating a standard test piece, .025 in. full to size, by heating in sand for the length of time and at the same temperature as would be used in carburizing, for the various types of steel. Test pieces were then allowed to cool in a box and given a full double treatment which would have been given a piece of the respective steels to put them in their best possible case-hardened condition. Test pieces were then ground to size and pulled.

In regard to the operation of carburizing, so much has been written upon this subject that it would be superfluous to go into it here in detail. Case carburizing compounds have been very thoroughly developed and compounds are available which will produce in the case different carbon contents—that is, 60 per cent, 80 per cent, 100 per cent carbon, etc.

Carburized pieces should not be quenched directly from the carburizing box, and this practice should not be followed, except in cases where a hard surface only is desired and nothing in the way of strength and toughness of core is expected. If carburizing temperatures are relatively low—i. e., about 1550 to 1560 deg. Fahr.—good results may be obtained by a single quench after pieces have cooled in the

*Paper read at the Cleveland meeting of the American Gear Manufacturers' Association.

Name	C.	MN.	Si.	P.	S.	Cr.	Ni.	E.L.	T.S.	El.	Red	Brinell	Sclero	Guillery Impact	Sclero of Case
Simple carbon	.20	.50	.20	.04	.04	....	....	50,000	75,000	20	55	190	30	18 Kgm	90
Mild chrome nickel	.20	.60	.20	.04	.04	.40	1.25	100,000	150,000	12	40	287	40	10	90
3½% nickel	.20	.60	.20	.04	.04	....	3.50	105,000	160,000	13	45	302	50	11	90
5% nickel	.15	.40	.20	.04	.04	....	4.75	125,000	175,000	15	50	321	54	10	90
Medium chrome nickel	.17	.40	.20	.03	.03	1.00	1.75	140,000	180,000	13	50	340	58	11	90
High chrome nickel	.12	.40	.20	.03	.03	1.25	4.00	150,000	200,000	13	52	375	60	10	90

carburizing box and have again been reheated to the proper temperature. For best results, however, a double quench after carburizing is desirable—the first quench from a temperature sufficiently high to refine the core, which is low in carbon, and the second quench at a proper temperature to refine the case, which is very high in carbon. Drawing after final hardening is desirable to relieve hardening strains and to secure increased toughness.

Warpage of case-hardened gears, as a result of heat treatment, always occurs to a greater or less extent. The warpage will be somewhat reduced if care is taken to anneal forgings before machining.

Forgings as they come from the hammer, and cooled under varying conditions, always have some internal strains. The release of these strains, by annealing, leaves the metal in a state of rest which makes possible a decrease in warpage in the finished pieces, for without the annealing, the strains in the metal, due to forging, often are relieved during the case-hardening operations, with the result that they are the direct cause of some of the warpage frequently experienced.

Tempered gears are made principally from four types of steel, two of which are in common use, while two types are more rarely used, especially one of the latter, an air-hardening chrome nickel steel, which has been used very little in this country. The table [on page 1220] will give you the type, analyses and physical properties of these steels in gear condition.

In addition to these standard types there has been sold a silico-manganese steel of approximately .50 per cent carbon, .75 per cent manganese and 1.50 per cent silicon, which has, when hardened and drawn for gear condition, an elastic limit of approximately 225,000 lb. per square inch. This steel when properly hardened remains practically constant as to size, and has proven most satisfactory as a steel for clash or change gears.

[The sections of Dr. Parker's paper dealing with gears for electric car service and gears for commercial and jobbing work are here omitted.—EDITOR.]

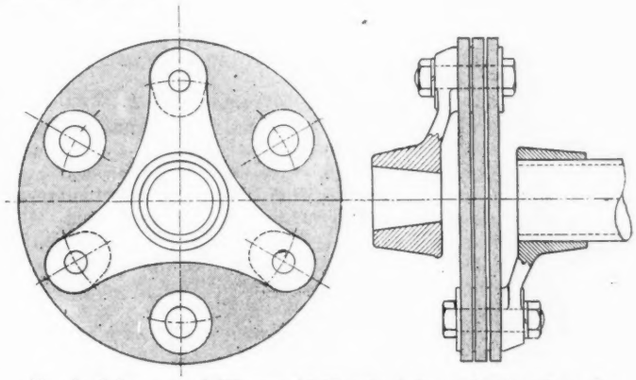
Layout for Flexible Universal Joints

THERE has been considerable discussion from time to time regarding proper layouts in connection with the flexible type of universal joints, such as the Thermoid-Hardy. The accompanying layout is typical, and has given good results on cars such as the Lexington Howard, Crow-Elkhart, and the Stewart trucks made in Buffalo.

The couplings are made up of laminated Hardy disks, and, as shown in the layout, consist of three disks, each joint having an overall diameter of 7 in., and being ¼ in. thick. This joint is capable of taking care of ⅞-in. lateral movement. Considering two joints for the propeller shaft, this would give each set of disks a movement of 7/32 in. each way, making a total of ⅞ in. play for the two joints.

The purpose in providing this range of lateral movement is to eliminate the use of splines on passenger cars wherever possible. In order to successfully do this the springs must be so flat that the lateral movement is within the limit of the joint. This is in line with present tendencies, as spring layouts are becoming flatter.

The coupling shown will stand an average driving angle of 6 deg., with a maximum of about 10, according to the manufacturers.



Typical layout of Thermoid-Hardy joint calculated to do away with sliding joints in cars with flat springs

Van Sicklen Chromometric Temperature-Corrected Tachometer

DURING the period of the war, the Van Sicklen Co. of Elgin, Ill., manufactured for the U. S. Government an instrument specially developed for airplane use, known as the Van Sicklen Type B tachometer. Tests are said to have shown this to be a highly accurate instrument. It measures either shaft speed or surface speed, indicating the shaft speed in revolutions per minute, and the surface speed in linear feet per minute. No watch is necessary in taking a reading.

The dial of the instrument is divided into hundreds. Revolutions per minute are registered up to 2500, and feet per minute up to 1250. By means of adapters it is possible to apply the instrument directly to the moving member. It takes just one second until the first reading can be taken. The indicating hand is held at this point for a second, is then released, and a new reading is given, showing whether the speed of the moving member has either increased or decreased during the interval. When the instrument is removed from the moving member the hand returns to zero.

These instruments are being manufactured in the works of the Elgin National Watch Co., which fact is being pointed to as a guarantee of their high-class construction. Two adapters are regularly furnished with each instrument, one of which transmits one-half the speed of the moving member to the instrument, the other the exact moving member speed.

The Van Sicklen tachometer comprises a complete watch mechanism, its principle of operation being that the counting mechanism is allowed to run for one second, and the number of revolutions made by the driving member during that period is indicated. The mechanism really divides into four parts, namely, 1, the driving mechanism, which takes the power from the flexible shaft and transmits it to the power plant; 2, the power plant, which furnishes power for driving the watch mechanism; 3, the counting mechanism and the synchronizing cam, which latter times the action of the counting mechanism; 4, the watch mechanism which times the action of the synchronizing cam and the counting mechanism.

Attendance and Turnover Records of Women Workers

A Comparison of the Lost Time Factors with Male and Female Operators—The Effects of Illness, Hours of Labor and Idle Shop Time—The Value of Rest Rooms and Rest Periods

IN considering the employment of women in industrial occupations, a factor which must be reckoned with is their attendance record. In the past, industrial experience has generally indicated that in this particular women employees fall below the standard set by men.

An analysis of the attendance records of 115 establishments in which an investigation was recently conducted by the National Industrial Conference Board disclosed that in 44 of these establishments the attendance of women employees is better than that of men. It is worse in 31 of the 115, and, in the remaining 40, there is little to choose between the records of the two sexes. The establishments in which the attendance of women was worse than that of men employed a total of 18,045 women, while those establishments in which women's attendance was better than men, employed only 10,481. The establishments in which the attendance records of men and women were equal, employed 9974 women. In other words, it can be said that with only 27.2 per cent of the total number of women in all 115 establishments was their attendance better than that of men.

In seeking for the reasons for the variation of attendance, an analysis of the sources from which the women workers came to these establishments did not give any clew to the cause. Furthermore, the type of work performed did not, apparently, in any way explain the differences in attendance. This latter statement is borne out by the fact that practically all operations on which women were engaged were represented among those establishments reporting poor attendance of women as well as among those reporting it as good or better than that of men.

Apparently the number of women employed bore some relationship to their attendance record. In more than half of the establishments, where the attendance of women was reported as better than that of men, and in half of those where it was equal to the attendance of men, there were employed 100 or less women, whereas nearly 80 per cent of the establishments reporting a poor attendance record for women employees employed a much larger number.

It is suggested by The National Industrial Conference Board, which compiled the data used in this article, and from whose report on the wartime employment of women in the metal trades the matter here printed is very largely taken, that there is a possibility that more individual adjustment and greater attention to health factors and to morale were possible where only a few women were employed.

TABLE I.—ATTENDANCE OF WOMEN WORKERS COMPARED WITH ATTENDANCE OF MEN IN 115 ESTABLISHMENTS
(National Industrial Conference Board)

	Establishments		Women Employees	
	Number	Per Cent of Total	Number	Per Cent of Total
Total	115	100.0	38,500	100.0
Women's attendance better than men's	44	38.3	10,481	27.2
Women's attendance equal to men's	40	34.8	9,974	25.9
Women's attendance worse than men's	31	26.9	18,045	46.9

While the replies to the schedule of inquiry which the Board sent out did not indicate a significant difference between the attendance of men and of women, when experience in other industries and other countries is considered, it appears that a higher average time loss because of absence must be counted among the unavoidable disadvantages connected with the employment of women.

Attendance of Married Women

Contrary to rather generally expressed opinion, it appeared that attendance of married women was fully equal to that of younger unmarried girls. The following table summarizes the information secured on this point:

TABLE 2.—ATTENDANCE OF MARRIED WOMEN WORKERS AS COMPARED WITH SINGLE WOMEN, IN 76 ESTABLISHMENTS
(National Industrial Conference Board)

	Number of Establishments	Number of Women	Number of Married Women	Per Cent of Married Women to Total Number of Women
Total	76	15,666	2,222	14.2
Women's attendance better than men's	33	4,965	575	11.6
Women's attendance equal to men's	23	3,488	723	20.7
Women's attendance worse than men's	20	7,213	924	12.8

No significant data were submitted in respect to the relation of illness to attendance of women workers. There is little doubt, however, that their poor attendance is largely due to illness. One-sixth of the women leaving their employment in a large machine tool plant gave poor health as their reason, a much larger proportion than among men.

Experience in Germany on this point is of interest. Data collected by the Leipzig Sick Benefit Society from 1887 to 1910 show that, among metal grinders and polishers, women averaged 1456 days of sickness compensated for per 100 members as compared with an average of 1215 days for men; among iron founders and machinists, women 1666 days; men 1189. The compensation records of German Sickness Insurance Societies from 1903 to 1908 indicate a 3 per cent to 5 per cent higher average time loss by women in most occupations than by men.

While these German figures include accidents they nevertheless indicate a higher illness rate among women.

The experience of a benefit society maintained in a large American silk factory is also significant. In March, 1918, $1,124.35 were paid in benefits to 1079 women members as against only $761.75 to 1843 men members. For the entire period from November 1, 1910, to March 31, 1917, the claims paid to men amounted to only $91,580.35 out of their contributions of $116,686.76, while the claims paid to women were $87,592.51, more than twice their contributions of $41,640.04.

A comparison of days lost through illness in 1914 by approximately 16,000 employees of the Government at Washington, D. C., over 4000 of whom were women, showed that the women averaged 8.90 days per annum, the men only 4.82.

All these figures indicate either more frequent or more serious cases of illness among women than among men.

Although poor attendance was frequently a disadvantage connected with women's employment, the greater stability of the female labor force offered some compensation. Of 94 employers reporting the comparative labor turnover of women and of men, 8 found that women's record was worse, 26 that it was equal, 60 that it was better, often by 20 per cent to 30 per cent.

A frequent comment by employers is that women are "steadier than men."

One reason advanced by some employers for the smaller turnover among women employees was their superiority to the class of men at present available. Another important consideration is that skilled men now have more opportunities to better their position by reason of keen competition for their services, and therefore are tempted to change from one factory to another.

Among the elements favoring stability of women employees has been the practically unlimited supply. Women, once secure in their positions, were naturally conservative about changing, and the sharp competition in the labor market reinforced this tendency. But the generally observed disposition of women to take their work and its surroundings more personally may, by proper organization of the factory, be made a valuable auxiliary in the reduction of labor turnover. Again, the home associations of women are more likely to restrain them from seeking employment beyond a limited field, since they usually feel a greater reluctance about breaking domestic ties and frequently have stronger social motives for remaining in their accustomed environment.

High Wages Cause Dissatisfaction

Yet an analysis of some of the cases reported indicates that with women, as with men, an increase in the demand for workers will be accompanied by a more active labor turnover. One manufacturer stated that high wage rates are making his women workers dissatisfied and that they are "trying out every job possible until they find something that suits." The treasurer of an establishment manufacturing machine needles reported a marked shortage of girls and a labor turnover of female employees 20 per cent higher than that of men. In a bolt and nut factory in Cincinnati it has been found necessary to hire twice as many women as men to maintain the force in a department where the majority of the women employed are working. Moreover, since a shortage of female labor is reported in many cities by the United States Employment Service, competition for women workers, unless regulated, will naturally increase, especially for those who have acquired some degree of mechanical skill. Nevertheless, even if radical industrial changes rendered women workers as much valued and sought after as men are at present, it is probable that both social conditions and psychological characteristics would restrain them from shifting from place to place as freely as men.

Working hours of women employed in industrial plants are limited by law in most states of the Union. The following list shows the daily and weekly maximum hours prescribed by law in states where the establishments included in this investigation are located.

TABLE 3.—LEGAL LIMITATIONS OF WORKING HOURS FOR WOMEN IN STATES WHERE THE ESTABLISHMENTS INCLUDED IN THIS INVESTIGATION ARE LOCATED

State	Daily Hours	Weekly Hours
Indiana	No limit	No limit
Iowa	No limit	No limit
Illinois	10	..
New Jersey	10	60
Connecticut	10	55
Wisconsin	10	55
Massachusetts	10	54
Pennsylvania	10	54
Rhode Island	10	54
Michigan	9*	54
Minnesota	9	54
Missouri	9	54
New York	9	54
Ohio	9	50
California	8	48

*As an average; 10 in any one day.

Table 4 shows the weekly nominal hours of work for women reported by 106 establishments, arranged geographically. In many establishments the hours for women were shorter than for men.

TABLE 4.—WEEKLY NOMINAL HOURS* OF WORK FOR WOMEN IN 106 ESTABLISHMENTS, BY STATES

(National Industrial Conference Board)

Geographical Distribution	Total Establishments	56 or Over	55	54	53	52	51	50	49	48	Under 48
Total	106	2	11	27	1	7	1	32	5	16	4
California	1	....	....	....	....	....	....	....	....	1	....
Connecticut	11	....	7	3†	....	....	....	1	....	....	....
Illinois	5	1	....	2‡	....	1	....	....	....	1	....
Indiana	4	....	1	....	....	1	....	2	....	....	....
Iowa	1	1†	....	....	....	....	....	....	....	....	....
Massachusetts	12	....	....	5	....	2	1	3	....	1	....
Michigan	17	....	....	7	....	1	....	7	....	....	2
Minnesota	1	....	....	....	....	....	....	....	....	1	....
Missouri	2	....	....	....	....	....	....	2	....	....	....
New Jersey	6	....	2	1	....	....	....	1†	....	2	....
New York	17	....	....	7‡	1	1	....	1	....	6†	1
Ohio	23	....	....	....	....	....	....	13	5	4	1
Pennsylvania	3	....	....	1	....	1	....	1	....	....	....
Rhode Island	2	....	....	1	....	....	....	1	....	....	....
Wisconsin	1	....	1	....	....	....	....	....	....	....	....

*In a very few cases hours are fractionally greater than indicated in the heading
†One establishment shorter hours in summer.
‡Two establishments shorter hours in summer.

This table shows that in 57 establishments women were working not over 50 hr. per week, while in 49 they were working longer hours, in most cases either 54 or 55. In 58 establishments in those states where a legal limit is set, women are working fewer hours than the law allows. The number of establishments reporting women employed on night work was almost negligible.

The following table, showing weekly nominal hours of work for women in the same establishments, by industries, makes it apparent that the specific industry as such had little influence on the length of the working day for women, since in each of the industries included the hours of work varied widely.

TABLE 5.—WEEKLY NOMINAL HOURS* OF WORK FOR WOMEN IN 106 ESTABLISHMENTS, BY INDUSTRIES

(National Industrial Conference Board)

Industry	Total Establishments	56 or Over	55	54	53	52	51	50	49	48	Under 48
Total	106	2	11	27	1	7	1	32	5	16	4
Automobiles and automobile accessories	9	....	....	4	....	....	....	4	....	....	1
Typewriters and other light machines	5	....	....	1	....	....	....	1	....	2	1
Electrical machinery, apparatus, and supplies	15	....	1	2	1	1	....	7†	1	2	....
Foundry and machine shop products	32	1	....	10‡	....	4	....	8	2	6†	1
Munitions	11	....	3	2	....	1	....	2	1	2	....
Railway equipment	3	....	....	....	....	1	....	....	....	2	....
Tools, cutlery, and hardware	14	....	3	5†	....	....	1	3	1	1	....
Miscellaneous metal products	17	1†	4	3†	....	....	....	7	....	1	1

*In a very few cases hours are fractionally greater than indicated in the heading.
†One establishment shorter hours in summer.
‡Three establishments shorter hours in summer.

The character or arrangement of work in many industries leaves more or less time during factory hours when employees are not engaged in actual physical effort or in concentrated attention.

An attempt was made to secure data on this point concerning women employees in the metal trades, but a question regarding the actual time lost because of pauses, waiting for stock, changes in tools and machinery, and similar interruptions, met the general response that the length of such delays was difficult to determine and that any statement must be based only upon estimates. No accurate data are available, but estimates by manufacturers place the loss from zero up to 25 per cent, and in one case, 50 per cent; they most fre-

quently ranged from 10 per cent to 20 per cent. The proportion varies, of course, in different occupations. In a machine shop where the average time lost was estimated at 20 per cent, it was put as high as 40 per cent for gear cutting operations and at 10 per cent for small turret lathe work. A manufacturer of electrical equipment who has had large experience with women workers for a number of years stated:

> In setting tasks for women it is our practice to allow an average of 20 per cent for lost time. This allowance varies according to the nature of the work from 15 per cent to 25 per cent, but we believe 20 per cent is a fair average.

A machine tool establishment where women perform all kinds of machine and bench work reported as a rough estimate that for about forty-five minutes per day of 9 hr. women employees are not engaged in actual physical effort. A very small part of this was attributed to waiting for work or stock, or to delays caused by the management, but the loss was largely due to ordinary relaxations attending employment.

On the other hand several establishments reported the proportion of idle factory time as practically negligible. In one plant women performing machine operations were shifted to bench work during repairs or setting up; in another, extra machines were available. In other cases, routing of stock was so carefully planned as to reduce delays to a minimum.

It should be remembered, however, that where no provision is made for systematic rest periods, chance pauses contribute to the recuperation of the employees. Furthermore, such time losses are also common where only men are employed.

Rest Periods

The relation of regular pauses during work hours to output and to avoidance of accidents is receiving increasing consideration by students of labor problems as the importance of the subject is made more evident by scientific research and practical experiment. Rest periods are evidently of special importance for women. Of the 127 establishments furnishing data for this investigation, only 20 were maintaining systematic rest periods; in three others they had been tried but discontinued. Several other manufacturers stated that they were seriously considering their introduction. The total number of women employed by the 20 firms was 18,546, of whom 14,954 were in 6 establishments manufacturing munitions.

In most of the factories where rest periods have been established, the pause varies in length from 5 to 15 min., usually in the middle of the forenoon and afternoon. In one factory a 10-min. rest period is allowed in the morning; in another, 10 min. near the end of the day; in a third, the women are at liberty to leave their machines two or three at a time for a lunch period once in the forenoon. It is doubtful whether the full benefit of the practice is secured by the last method, since the time allowed is not definitely specified, and there is danger that ambitious workers will cut short or omit the pause allowed.

In some establishments light physical exercise or recreation such as music or dancing is combined with rest periods.

The length and distribution of rest pauses is sometimes determined by the character of the work. For instance, in a munition factory where women are engaged on operations which involve close concentration and considerable eye-strain, a rest period of five minutes is allowed at the end of each hour.

Many of the opinions expressed were favorable to the plan of two rest periods a day. An establishment manufacturing cash registers reports:

> We have recess periods of 10 minutes in the morning and 5 minutes in the afternoon. We have had this plan in operation a number of years and are thoroughly sure that it is profitable to the employees as well as to the company.

A plant making machine tool fixtures, with 140 women at work, reported:

> We allow women employees 15 minutes rest in the forenoon and afternoon. They also stop work 5 minutes earlier at noon and 10 minutes at night, making 45 minutes in all; we find it works out very satisfactorily.

In numerous establishments where no regular rest periods are arranged, the understanding is that women workers may rest when they feel it is necessary.

An automobile manufacturer stated:

> We have not inaugurated rest-periods in our factory; but the women in our employ are at liberty to leave their work at their pleasure. Where it is necessary, we have utility women to fill in in such cases.

A compulsory rest period would probably be of greater advantage to both employer and employees. Workers take rest periods, whether they realize it or not, but often at irregular and ill-chosen intervals. Moreover, women are generally reported as more inclined than men to overwork, and the temptation of a high piece rate may lead them to continuous overexertion which ultimately contributes neither to the output of the establishment nor to the health and earnings of the worker.

In some other factories rest periods of an indefinite character are under control of supervising matrons in the different departments, who look after the general physical welfare of women workers.

In the majority of establishments making no specific provision for rest periods, apparently little attention had been given the subject. Usually no comments were offered, but it was sometimes stated that the work was very light, or that rest periods were not needed, or that the workers could rest when they pleased, as they were employed on piecework.

Rest Period Results Uncertain

In a very few instances employers reported no positive advantage from rest periods. A munitions establishment stated that the results were "intangible." In this case pauses were allowed only to women polishers and inspectors. A manufacturer of enamel ware employing women on dipping, labeling, and wrapping did not consider the practice of special value. In one factory where rest periods were tried but given up, the workday was proportionately shortened.

In some factories opposition comes from the employees who do not wish to lose the time from piecework. Such objections of pieceworkers do not appear to be well founded, since rest pauses do not necessarily involve a loss in production. One large typewriter factory reported:

> The management has established two general rest periods of ten minutes every day, which have proved to be very satisfactory. By means of a chart plotted some time after the installation of rest periods, a slight increase in production was shown to have taken place. While it is not claimed that this is due to rest periods, it at least shows that there has been no loss in product due to this cause.

Extensive evidence, notably the experience of British munition factories, indicates definitely that rest periods are advantageous from an economic point of view both to employers and employees. In British factories tea is often served to the workers at their machines during rest periods. This custom is generally regarded as a valuable aid to output. A similar practice prevails in some American establishments, where milk is furnished at cost.

In its final report the British Health of Munitions Workers Committee said:

> Pauses, well distributed and adapted in length to the needs of women workers, are of the highest value in averting breakdown and in giving an impetus to output. The Factory Acts permit in textile factories a maximum of four and a half hours continuous work: in non-textile the limit is five, but many managers believe that four hours is the longest period during which a woman can maintain continuous work at full vigor. Within this period a pause of ten minutes has been found to give excellent results, and where the spell is continued for five hours some such pause should certainly be made for a cup of tea or cocoa. It is particularly valuable in the morning spell in those numerous cases where breakfast has been hurried or omitted altogether.

In view of the favorable results obtained from rest periods, the problem calls for most careful investigation, to which employers can contribute valuable assistance by observation of the results of experiments as to the proper length of the pause and its position in the work period as well as its relation to the type of occupation and worker. Such considerations, moreover, are applicable to men as well as women workers.

Provision of such facilities as first aid and hospital rooms, rest and lunch rooms, as well as generally attractive working surroundings, is especially important where women are employed.

Effect of Water Injection on Gasoline Engines

Bureau of Standards Tests Show No Power Gain or Decrease of Carbon Deposit Except in Case of Engines with Defective Cooling Systems

THE practice of injecting water in conjunction with the fuel is quite common in kerosene engines, the object being to keep down the cylinder temperature under conditions of heavy loading and prevent preignition. In fact, it seems almost impossible to operate an Otto cycle kerosene engine and get satisfactory results without water injection. There also has been considerable experimentation with water injection (or induction) in gasoline engines, not by the manufacturers of the engines, but by makers of fuel conditioners and their customers, who believe that the injection of water will lessen or eliminate the formation of carbon deposit and increase the fuel economy.

In the development of aircraft engines the suggestion was made that if water injection had these effects it should be beneficial in aircraft work. The problem was assigned by the National Advisory Committee for Aeronautics to the Bureau of Standards, and an extended investigation was made. The tests were carried out on a Class B military truck engine, and also on a Rutenber 6-cylinder, 3 x 5-in. engine, which operated at high jacket temperature. Thus, although the investigation was made at the instigation of the Aircraft Department, the tests were conducted on a truck and an automobile engine, but the results, of course, are of general application.

Two Series of Tests Made

In a general way, two series of tests were made, one to determine the effect of water injection on the maximum power obtainable from an engine and its fuel economy, and the other to determine its effect upon the carbon deposit on the piston head and cylinder walls.

It may be recalled that the Class B truck engine is a 4-cylinder design with a bore of 4.75 in. and a stroke of 6 in. The compression ratio is 3.7 and the piston displacement 425 cu. in. Compression tests made by means of an O-Kill indicator showed an average compression of practically 48 lb. per square inch at 100 r.p.m., the water jacket temperature being 131 deg. Fahr. In the tests this engine was connected up to a 125-hp. Sprague dynamometer, by means of which the horsepower output was measured.

In the first test the Class B engine was fitted with a Zenith L-6 carbureter. Each series of tests consisted of three runs. After the engine had been brought up to operating temperature the carbureter was adjusted for maximum engine power at full speed, only gasoline being fed into the cylinders. After the engine had been run 5 min. under these conditions, another run was made with water injection, with the same carbureter and spark setting. Finally, during the third run, also of 5 min. duration, the water injection was continued, and the spark was adjusted to give the greatest engine output. Series of tests of this kind were made at speeds of 400, 600, 800, 1000 and 1200 r.p.m. The water was admitted to the manifold at a point 1¾ in. above the throttle valve, and the amount of water fed was read off from a graduated glass cylinder of 1000 cu. cm. capacity, while the time was taken from a stopwatch. A stopcock in the line between the graduated cylinder and the intake manifold permitted of controlling the water feed.

Three complete series of tests, each covering the whole range of engine speed, were run with the Zenith carbureter. In the fourth test a Stromberg N-3 carbureter, with a 1 5/32 in. choke and a 0.0635 in. bleeder, was substituted for the Zenith, this carbureter permitting of varying the fuel mixture for different speeds. Thus, the effect of water injection could be studied when the fuel mixture was adjusted to be as lean as possible consistent with smooth running, and also when a rich mixture was being fed. In one of the runs a metal plate, with asbestos gasket, was inserted between the intake and exhaust manifold, so as to shut off some of the heat flow from the exhaust to the inlet manifold and permit of determining the effect on the operation due to the lower temperature of the mixture thus obtained.

The final tests with the Class B engine were made under spark-and-throttle conditions simulating road-operating conditions of the motor truck.

Amount of Carbon Deposit

One of the chief claims made for water injection in gasoline engines has been that it reduces the amount of carbon deposit and that it will even remove deposits already formed. In order to test the validity of this claim, a Rutenber six-cylinder, 3 x 5-in. engine was mounted on the test stand and fitted with a fan brake to load it down. Cooling water was circulated by gravity, and in order to form a carbon deposit of some thickness the engine was run for several days with a rich mixture, late ignition, and low jacket temperature. Occasionally oil was injected into the cylinders. At the end of the 6-hr. period, all interior portions were covered with a substantial layer of carbon.

The engine was then run for another 6-hr. period under wide-open throttle, water being injected into the manifold as in the previous tests. During this run the waterjacket temperature was kept high, the outlet temperature being maintained constant. At the conclusion of this run the cylinder head was removed and the carbon deposit in the combustion chamber examined, but no noticeable effect was found. Other similar tests were made, the rate of water injection and the temperature of the jacket water being varied. The rate of water feed varied from 2.4 pints to 7.05 pints per hour. With the higher rates of water feed the engine power output was noticeably decreased.

The results arrived at have been summarized by the experts of the Bureau of Standards somewhat as follows:

No appreciable effect is produced upon the power, fuel economy and general operation of a gasoline engine by the injection of water into the cylinders at rates varying from 0.03 to 0.44 lb. per brake horsepower-hour. When water is injected at a higher rate than 0.44 lb. per brake horsepower-hour there is an appreciable decrease in the power output, fuel economy and smoothness of operation. It is quite probable that in a badly carbonized engine, or an engine of defective design, in which there are hot spots that cause preignition, the injection of the water results in an increase of power. In an engine operating at high waterjacket temperature the injection of water in amounts between 2 and 8 lb. per hour produces a softening and slight reduction of carbon, this reduction not exceeding 25 per cent and being most noticeable on the piston heads and valves. However, water injection at the maximum rate also causes a considerable reduction of power.

What Return of Railroads Means to Automotive Industry

Shippers Expect Improved Relations to Result—Hope for a Slight Reduction in Rates—Increased Efficiency Is Anticipated When Competition Is Resumed

By Allen Sinsheimer

"The railroads will be handed over to their owners at the end of the calendar year."—PRESIDENT WILSON'S *Message to Congress.*

WASHINGTON, June 2.—What does the return of the railroads mean to the automotive industries? Their return to their owners is practically assured by President Wilson's message and the well-defined sentiment of members of Congress. Under the existing law the President may return the railroads without the aid of Congress. The Legislature can, however, if it desires, pass legislation before the end of the year which would continue the Government control despite the Presidential declaration; but this is not anticipated. There is an almost universal demand that the roads be returned to private control.

The control over the roads by the Government had broad effect on automotive shipments. There has been an unprecedented rate increase. The time of shipments has increased. There has been remarkable improvement in car service supply. There has been a loss in general efficiency despite this one improvement.

The lack of competition, with a consequent lessened eagerness to give service as an inducement to hold business, is the chief disadvantage resulting from Government control, according to traffic managers. They do not like the present system, which lacks the keen competition of the past, when railroads vied with one another for business, and as a result were constantly improving service. For example, the freight shipments today are frequently from 24 to 36 hr. slower than in 1915 or 1916. From Detroit to St. Louis, for instance, it requires four days now, as compared with three days before Government control. Traffic managers find it useless to appeal for improvement. They find themselves as helpless as the ordinary citizen who attempts to purchase a postage stamp exactly one second after the closing hour of the post office. Likewise, because of a lack of competition and the zest for business which it creates, there have been arbitrary rulings, regulations and freight-rate changes made under such conditions that shippers were not allowed sufficient time to adapt their business, and were forced to comply at a loss.

Again, under the non-competitive arrangement there has been a policy of "if it doesn't go to-day it will go to-morrow." Work was discontinued on Sundays. Important trains were taken off.

The return of the roads to their owners, it is believed, will mean a resumption of the competitive basis to a certain degree, with a consequent renewal of the former business methods of constant improvement to gain new business. A number of railroads have suffered the transfer of their business to other roads under the Government management, and it is anticipated that these will be particularly keen to regain the lost trade.

The probability of a reduction in freight rates is slight. There may be a small saving effected in operating costs by the railroads under private management, as compared with Government operation, which has been costly, and this may allow some slight decrease. Wages, however, are an important factor in freight rates, and the great increases that have been awarded the railroad employees by the Government will probably stand in the way of freight-rate reductions. Some idea of the increase in freight rates can be gained from the following comparison:

Automobile Freight Rates Per 100 Lb.

	1914	1916	1919
Detroit to New York.....	64.5	67.5	97
Detroit to St. Louis.....	50.5	53	87.5

Those who have studied the railroad situation recommend that the return of railroads to their owners should:

Be preceded by government legislation authorizing combinations and pooling of equipment and resources;

Be preceded by formulation of standard rates and regulations;

Contain legal provision protecting weaker roads;

Be preceded by regulation of wages;

Include strict government regulation.

Under private control, freight rates will again be determined by the Interstate Commerce Commission, instead of by railroad officials, and this is expected to result more favorably to shippers. Under the existing plan, local boards in certain districts comprising three railroad men and a minority of two shippers determine the rates, and the shippers have found themselves at a complete disadvantage because of their minority.

One of the most important advantages that automobile shippers have found under Government control is in the distribution of au-

tomobile freight car equipment, due to the fact that the Railroad Administration placed representatives in each shipping center to allocate the cars. This arrangement, combined with the fact that the Administration ruled against shipments of partly filled freight cars, has created a surplus of shipping equipment.

Under private control, any such plan whereby freight cars would be pooled and apportioned would be in direct violation of the existing anti-trust laws, and consequently shippers are urging Congressional legislation which will allow the private owners of railroads to combine and pool their resources on a plan similar to that employed by the Railroad Administration. If the railroads can pool certain resources, shippers urge every advantage developed under Government control will continue under private control, together with the other advantages of competition which were lost under Government supervision.

Shippers expect the return of the railroads will:
Increase the general shipping efficiency;
Bring slightly lower freight rates;
Improve the time of shipment between points of shipment and destination;
Create better personal relations between shippers and the roads;
Renew the constant improvements in service that existed under the competitive plan.

That there must be legislation before the roads can be returned to private owners has been recognized by practically all authorities. The speeches before the U. S. Chamber of Commerce convention at St. Louis, by W. B. Hines, Director General of the Railroad Administration, Senator A. B. Cummins, and the report of the Chamber's Railroad Committee, all advocated legislation permitting reasonable competition and a consolidation of the railroad systems that would enable the merging of the weaker roads with stronger ones, thereby leveling the inequalities of costs and revenues. This would mean the formation of all roads of the country into eighteen or twenty systems, under private control, but regulated to an extent by the Government.

Railroad owners object in part to this plan. They desire legislation authorizing combinations, but prefer to be allowed to form voluntary combines. As a permanent solution of the railroad problem Mr. Hines suggested that the railroads should have a fair return on the fair value of their property. This value must be determined before the necessary legislation can be passed. Out of the 180 railroad companies operating, generally at the same rates, and regardless of operating costs, some earned 2 per cent, while others earned as much as 10 per cent, and, said Mr. Hines, legislation must provide protection for the weaker roads by some combination plan whereby certain strong roads will be obliged to absorb or work in conjunction with the less profitable systems.

Merging of Roads Would Cure Many Ills

The existing absence of standards of rates and regulations, the disparity between the profits of the weaker and stronger roads, the absence of a definite point of contact between the Government and private management and the possibilities of overcapitalization and exploitation are the problems that must enter into Congressional consideration and legislation. These can all be overcome, said the Director General, if the roads are merged into a few large competitive systems, with from twelve to twenty combinations in the three great sections of the country—the West, the East, and the South—with each combination including enough of the more or less profitable roads to equalize the situation.

There should be, he claimed, an official capitalization, Government representation on each controlling board, and standardization of rates and regulations.

The plan advocated by the Chamber of Commerce committee recommends that:

1. Corporate ownership and operation of the railroads should be adhered to under Government regulation.

2. Remedial legislation should be enacted prior to the return of the roads to their owners.

3. Public authority should be granted for consolidation of the railroads into a limited number of strong competing systems, so that each principal traffic center of the country will be served by more than one system.

4. That railroads engaging in interstate commerce shall be required to change from State to Federal corporations, with suitable provisions for taxation and police regulation by the several States.

I. C. C. to Pass on Expenditures

5. That the Interstate Commerce Commission should be authorized to pass upon expenditures of capital in excess of a stipulated amount by the roads and to determine the conditions of the issuance of securities.

6. That the Interstate Commerce Commission be given authority to regulate intrastate rates when those rates affect interstate commerce.

7. That rates and fares fixed by the Interstate Commerce Commission must by law be sufficient to yield the companies a fair return upon a fair value of the property, the value to be determined by public authority.

8. Legal enactment of rules of profit sharing whereby railroads will turn over excess profits to be used to strengthen the credit of all railroads and make them more efficient.

9. That a Federal Transportation Board be created to develop transportation by rail, water and highway.

The Chicago & Northwestern Railroad and the Chicago & Great Western Railroad were pointed out by Senator A. B. Cummins as examples of weak and strong roads and of overcapitalization. The Chicago & Northwestern, which is capitalized at $46,000 per mile, has an average net operating income of 6.13 per cent on its property investment account, while the Chicago & Great Western, capitalized at $77,000 per mile, has an income of 1.77 per cent. "It requires no argument," stated the Senator, "to convince one that the Chicago & Great Western company cannot perform its duty to the public and survive under such conditions."

He advocated a series of consolidations to merge weak roads with strong ones, a Government guarantee of a return upon the capital invested in railways, and the operation of the roads through private corporations under the strictest Government control. "The Government," he declared, "cannot operate the railroads either economically or efficiently. It costs the Government more to do anything in a country like ours than it costs anybody else to do the same thing."

Temperature Control on A-C Speedometer

New Magnetic Instrument Is Fitted With Thermostatic Compensator

THE A-C speedometer brought out by the Champion Ignition Co., Flint, Mich., is a magnetic type of marked simplicity, and with an ingenious method for regulating and maintaining accuracy in spite of variations in temperature.

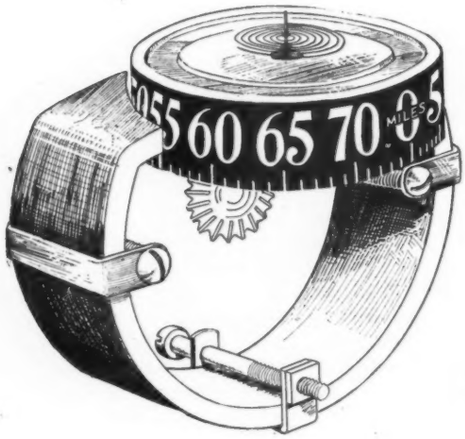
The speedometer operates entirely on the magnetic principle, having a stationary permanent horseshoe magnet held securely in the interior of the instrument in a manner which is similar to magneto and galvanometer construction. The magnet is stationary and the armature rotates within it, being driven by the flexible shaft which is connected with the driving mechanism of the car. The armature revolves in the magnetic field between the poles of the horseshoe magnet, the magnet poles being ground to receive it.

The armature is segmented into poles, the magnetic current passing through them and thrown or shunted in the direction of rotation, carrying with it a non-magnetic element in the form of an inverted aluminum cup having on its periphery the scale which indicates the velocity of the vehicle either in miles or kilometers per hour. The light weight of the aluminum cup renders it so sensitive to the magnetic drag that the instrument starts to register at a speed of 1 mile per hour. The speedometer is graduated up to 75 miles per hour, with graduations indicating every mile. The indicating element is a hair line crossing the glass window through which the speed is read in much the same way as the hair line on a slide rule indicator.

New A-C magnetic speedometer with flexible shaft. Note how flexible shaft is connected to center of back of speedometer

Objections to magnetic speedometers in the past have generally centered around the fact that the magnet expands in warm weather, thereby removing the poles to a greater distance from the armature. This slight variation is compensated for in the A-C instrument by an automatic thermostatic control which changes the relation of the armature laminations one to the other, thereby advancing or retarding the magnetic flux as may be necessary. In this way the speedometer will give correct reading regardless of the temperature conditions. There is an adjusting screw for making the primary setting on the magnet, and this is set at the factory and then sealed so that it cannot be tampered with by the ordinary user to throw the speedometer out of adjustment.

The construction of the instrument is such that the speed recording elements are contained in one-half of the housing and the odometer components in the other. The only connection between the two is a worm shaft which operates the odometer. The odometer will register mileage covered by the vehicle up to 100,000 miles and repeat on the total, which in this instrument is placed on the right hand side, it being considered more natural to read totals summed up to the right. The trip register, which can be reset at will, either forward or backward, to any desired figure, is placed at the left. It registers in miles and tenths of miles to 100 and repeats, the tenth figure being the same color as the unit figure, but divided by a decimal point, just as it would be read in a touring



Magnet and rotor of A-C speedometer, showing thermostatic compensator on rotor

guide book. The reset guide or button is placed in the center of the face, which makes the instrument symmetrical. The resetting knob is very much the same as the stem wind knob on a watch, and it is quick in action, requiring only a straight pull out, whereupon the reset may be rapidly made.

The two halves of the speedometer are assembled and united by a steel band forced over the broad flange surface of the instrument by pressure. The moving parts are fully jeweled, having two large jewels of sapphire and garnet. There are several design features which are unique in the instrument, a valuable point being the connection of the flexible shaft to the back, so that it can be hidden completely from view in mounting on a car. The neck to receive the shaft is concentric with the instrument and has a 7/8-18 S. A. E. (spark plug) thread. The ferrules have a tapered fit, making alignment perfect.

The speedometer is held into the instrument board of the car by a patented band clamp having slots tapered so that when turned projections go into the slots and cause a forward movement of the clamp, thereby securing it. It is locked by tightening a screw.

The front face of the instrument is metal, being die cast of aluminum, with an enamel finish of gun metal shade. The escutcheon flange is either nickel or enamel or can be made in any desired finish. The back part of the instrument is also die cast and oxidized black. The reset knob in the center is nickeled. The figures on the indicating and registering member are white on black as a standard, but can be had reversely. The Caslon type of figures are used because of the ease with which they can be read.

A special flexible shaft has been made for this instrument and greater durability and strength are claimed for it. The cable is made of alternately wound monocoil music wire of four layers, each layer having four strands totaling 3/16 in. diameter. The cable ends are secured by patented process and guaranteed by the manufacturer not to break loose. The coupling nuts are made large for good contact. The casing is of tempered material wound with two strand wire and coiled tightly to hold grease in case of severe bends and still keep its shape. All of the parts are rust proof. The flexible shaft runs at 168 r.p.m. at 10 miles per hour, varying directly with the velocity of the car, or in other words 1008 revolutions at 60 miles an hour. The travel of 1008 revolutions per mile is the basis for figuring all gearing with which to drive it.

The instrument will be standard equipment on Buicks and other cars during the coming season.

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PAINTS sensitive to temperature changes are used a great deal for indicating dangerous heating in machine bearings, electric plant, etc. The double iodide of silver and copper is usually red, but blackens at 188 deg. Fahr., and again turns red when the temperature falls by the same amount.

A writer in *Die Werkzengmaschine, Zeitschrift des Vereines deutscher Ingenieure* gives a satisfactory recipe for making the paint. Copper sulphate and sodium iodide are dissolved separately in distilled water, the sodium oxide solution then being gradually stirred into the other until the deposit which at first forms disappears. A strong solution of chloride of mercury is then added, the double iodide of mercury and copper being precipitated. The deposit is filtered and dried, and is in the form of a red powder. It is then mixed with a weak solution of gum arabic, and can then be applied as a paint. Another medium is the double iodide of mercury and silver, which is light yellow when cold and turns a dark orange or brick red at about 113 deg. Fahr. This paint resumes its original color if not overheated.

Baker Two-Speed Axle

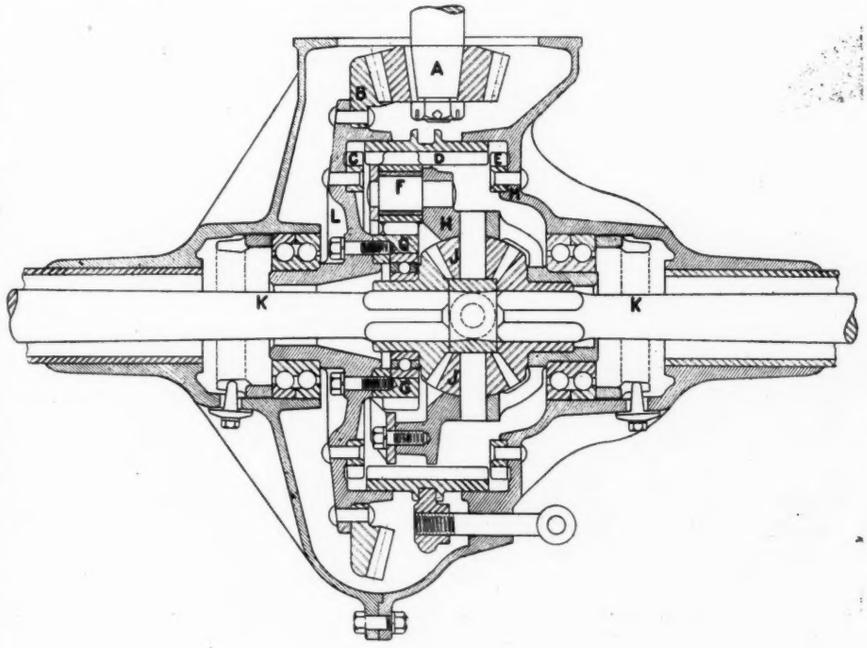
AN interesting form of two-speed axle has been invented by A. F. Baker and is being marketed by the Perfecto Gear Differential Co. of Seattle. This axle has been under test for some time on a 1-ton truck, and the maker claims that it has shown very satisfactory performance. The axle furnishes two ratios, one of 10.9 to 1 and the other of 3.9 to 1 on high speed. The two speeds are secured by means of an internal gear arrangement, as will be shown.

Referring to the section of the axle, the drive enters the axle housing at the bevel pinion *A* meshing with the ring gear in the customary manner. The ring gear *B* is riveted to carrier *L*. The annulus *D* is the chain speed gear. When it is in mesh with *C* it is in high gear and the drive is given solidly through the ring gears to the differential housing in the usual manner. When the annulus *C* is in mesh with *E*, which is riveted to the casing *M*, the internal gear action is set up resulting in the greater reduction.

On high gear the drive passes from the pinion *A* to the ring gear *B* and thence solidly through the fixed gear *C* to the annulus *D*, the pinion *F* and thence to the differential housing *H* and through the differential gear *J* to the axle *K*. This is quite similar to the usual bevel gear drive.

In low speed the annulus *D* is thrown over to mesh with the fixed gear *E*, which is riveted to the casing *M*. In this instance the drive passes from the bevel gear *A* to the ring gear *B*, which carries with it the front wheels *G*, which in turn carry with them the planet wheels *F*, rotating on the entire differential housing *H*.

Thus the double reduction is secured and the low speed ratio provided.



Lubricating Oil Program of the Bureau of Standards

An Outline of the Problems Which It Is Proposed to Solve by Experimental Research Work

A GENERAL experimental investigation of the subject of lubricating oils has been undertaken by the Bureau of Standards. A special oil laboratory has been fitted out in the Northwest Building of the Bureau at Washington and a program of experimental work has been laid down which, if carried through, should throw much new light on the subject of lubricants.

During the war the various divisions of the War Department having to do with automotive apparatus often needed information on lubricants. They found they could not get this from the oil companies, and so it was decided to install equipment at the Bureau of Standards to determine the facts at first hand. The demand for information came chiefly from the Bureau of Aircraft Construction, and it will appear from a perusal of the program that it was laid down with a special view to the lubrication requirements of aircraft engines; but we are in position to state that it is planned to make a parallel study of the lubricating requirements of other classes of automotive apparatus as well.

One thing that should make the proposed study of great economic value is the enormous waste occasioned by throwing away the oil from the crankcases of kerosene-burning tractor engines after it has served from 30 to 40 hours. This oil retains practically all its original lubricating value, and the only trouble with it is that it contains a considerable proportion of light hydrocarbons which act as a diluent. If systematic attempts were made to regenerate this oil it should lead to a great saving.

The program as printed below has been laid out under the direction of C. W. Stratford, a well-known oil expert. Mr. Stratford also selected the equipment of the laboratory. This lubricating oil section of the Bureau evidently needs and deserves the whole-hearted co-operation of the automotive industries as well as that of the oil industry.

THE PROGRAM

The general purpose of this investigation is to collect as much information as possible pertaining to the many problems involved in the lubrication of internal combustion engines. The majority of these problems have been well recognized in the past but their real importance and the necessity for their solution have been further emphasized during the war, especially in aircraft engine and farm tractor engine operation.

The secondary purpose of the investigation is to determine the real value and importance of laboratory methods now used in oil testing and of the significance of the results as an indication of the value of oils in practical service. It is hoped that new tests of value may be developed to supplement those now in use.

It is the earnest desire of the Bureau to secure the whole-hearted co-operation of oil refiners, large and small oil users and other interested parties in this investigation. All suggestions for the improvement of the program and constructive criticisms of same from all sources will be heartily appreciated.

So far as present knowledge goes the ideal lubricating oil should possess the following characteristics:

(a) Maximum reduction of friction.
(b) Minimum amount of wear of rubbing surfaces.
(c) Maximum length of time that oil can be used in service.
(d) Minimum rate and minimum amount of decrease in lubricating efficiency.
(e) Minimum carbonization in combustion chambers.
(f) The greatest security against seizure consistent with maximum lubricating efficiency.

It is proposed to determine what oil or oils most nearly approach this ideal.

Some Specific Problems

(1) To determine the cause of reduction of lubricating efficiency, i.e., whether it is due to change in viscosity alone or to the presence of decomposition products in the used oil or to both of these factors.

(2) Does the lubricating efficiency of an oil depend upon any other characteristics than those usually recorded in specifications, such characteristics as for instance adhesion, specific heat, thermal conductivity, "body," etc.?

(3) What relationship exists between the flash and fire points of an oil and its boiling point range?

(4) What predictions may be made of the specific consumption of oil in an engine from the values of the flash, fire, and boiling point range? Should the entire boiling point range or any part of the boiling point range of an oil be limited?

(5) What are the relative values of the Conradson carbon residue test and the Waters or other oxidation oven tests as means of predicting the decomposition which will occur in any lubricating oil in service?

(6) Does the presence of emulsifying products in an oil affect its lubricating efficiency in service? What disadvantage in reclamation processes are caused by the use of emulsifiable oils?

(7) Does the presence of colloidal matter such as deflocculated graphite, carbon or carbonaceous matter affect the lubricating efficiencies of oils? What is the relative value of settled unfiltered cylinder stock (which contains colloidal matter as well as solid or semi-solid matter in suspension) compared to the same cylinder stock in the filtered condition when these oils are used for blending with light hydrocarbon oils?

(8) What are suitable oils for use in Gnome or other similar types of rotary engines—castor, mineral blended with castor (using oleic acid as a binder), or mineral blended with other fatty oils?

(9) Is it desirable to blend fatty oils (high or low acidity) with mineral oils and what effect does the presence of fatty oils have upon the decomposition of mineral oils of paraffin and naphthene bases?

(10) To what extent do lubricating oils of paraffin and naphthene base, blended with fatty oils, absorb fuel vapors?

(11) How may it be judged when an oil has reached such a condition that it should be discarded or reclaimed?

(12) How may the appropriate viscosity or other characteristics of an oil for any given engine be determined, giving due consideration to seasonal changes in temperature, wear of engine parts, peculiarities of lubricating systems, etc.

(13) What are the relative merits in service of lubricating oils manufactured from paraffin and naphthene petroleums?

(14) To what extent does the character of bearing metals in contact and the condition of their surfaces influence lubrication?

Engines and Engine Test Methods

It is proposed to make tests of oils in the following aviation engines:

(1) Liberty twelve-cylinder.
(2) Liberty six-cylinder.
(3) Hispano-Suiza 150 hp.
(4) Gnome rotary.

Mechanical Conditions—Record peculiarities of engine lubricating systems, bearing clearances, specific bearing pressures, compression ratio, type pistons and rings, piston clearance and all other mechanical features of importance. The large bores in the crankshaft should be plugged with aluminum to facilitate removal of oil from system without taking down between test if desired.

Rate of Oil Flow—The oil flow from the pump to bearings will be measured by a venturi. If possible the actual rate of oil flow through all bearings should be determined at the normal revolutions per minute of engine by direct measurement.

Running Records—Barometer, temperature, inlet air, humidity.

Constant	*Variable*
(1) R.P.M. of engine.	(1) Horsepower.
(2) Fuel consumption.	(2) Oil consumption. (a) Burned. (b) Leakage. (c) From breathers (vapor).
(3) Jacket water inlet temp.	(3) Oil temp. outlet to cooler.
(4) Oil, inlet to pump temp.	(4) Oil temp. from crankpin cheeks.
(5) Oil pressure.	(5) Water temp. outlet. (6) Condensate from breathers. (a) Oil. (b) Volatile. (c) Gas.

Test Periods—It will be necessary to determine whether the same amount of decomposition can be obtained in 1 hr. runs as in 5 hr. or longer periods. A standard test period will be chosen for all tests.

Special Tests—(1) Fuel Absorption. Runs should be made with paraffin base and naphthene base lubricating oils using as fuels, (a) dry gasoline vapor, (b) aviation gasoline and (c) average automobile gasoline with each oil for the purpose of determining the relative amount of fuel absorbed by each and the character of the compounds absorbed.

(2) Carbon Deposits. Runs should be made with (a) paraffin, (b) intermediate and (c) naphthene base lubricating oils and a record made by photographing the piston heads and noting the amount and character of the carbon deposits on the remainder of the explosion chambers.

Standardized Test Fuel—A sufficient quantity of aviation gasoline made from the same refinery distillate should be provided for the completion of all engine tests. Whenever any change is made in fuel, then a standardized lubricating oil should be used to determine whatever variation may occur because of the change in fuel.

Standardized Lubricating Oil—It is highly advisable to standardize some lubricating oil for use during all engine tests to check any variation other than that caused by lubricating oil. A sufficient quantity of this oil should be provided to meet the requirements of all check tests.

Theory of Lubrication

Adhesion—(1) Determination of method or methods of measuring adhesion on the following groups of oils:

(a) Hydrocarbon oils of different bases, and each of different viscosities and volatilities.
(b) Fatty oils—prime lard, "acidless" tallow, castor and sperm, also same with different proportions of oleic acid, cotton-seed, etc., also cutting oils.
(c) Blends of hydrocarbon oils and fatty oils, also hydrocarbon and castor blends with oleic acid as a binder.

Study of cutting oils, and the bearing cutting oil properties have on lubrication. Power consumption for cutting operations with and without cutting oils.

Study of Oil Films—1. Behavior of films at constant temperature on plates, also on plate with temperature gradient, to determine drainage and rate of spread.

2. Behavior of films on different metals with localized heating.

3. Behavior of films on water, as a possible means of throwing additional light on the present knowledge of oil films as applied to lubrication.

Thermal Properties—Specific Heat, Heat Conductivity and Thermal Expansion on same groups of oils as given under Adhesion.

Friction Machines

The practical usefulness of friction machines in general has been widely commented upon and questioned in the past. In order to definitely settle the real value of friction machines the following program of investigation is proposed:

(1) Study of present stage of the art.

(2) The analysis of all existing machines comprising the following general items:

(a) Information is desired as to whether a reading can be made of the critical point of film breakdown, *i.e.*, incipient seizure of bearing at different loads, speeds, and viscosities at the temperature of oil film in the bearings, also when using different bearing metals.

(b) Method of applying lubricant to rubbing surfaces.

(c) Method of regulating all operating conditions.

(d) Recording devices, automatic or otherwise.

In the preparation of the above analysis it is desirable to draft a chart in which as much information as possible may be given in tabular form for direct comparison.

With all the above data at hand, then complete detail specifications should be prepared of an Ideal Friction Machine on which all determinations desirable could be made.

Division VIII, Metallurgy and the Division studying lubricants will fully co-operate with reference to bearing metals and tests.

Routine Tests

Fresh and Used Samples

1. *Gravity.*
2. *Flash.*
3. *Fire.*
4. *Viscosity.* (Saybolt Universal) at 100 deg., 150 deg., 212 deg. Fahr.
5. *Color.* 1. Fresh.
   2. After heat test.
   3. Used oil from engine.
6. *Emulsion*—Shaker (Coles).
   Demulsibility—Herschel; Stirrer.

Note—Oils more viscous than 50 sec./212° will be blended 50/50 with standardized petroleum ether for shaker emulsion tests.

7. *Cold Test*—A. S. T. M. method.

Special Laboratory Examination

Carbon Residue—Carbon residue values will be determined by means of the Conradson carbon residue apparatus as described in the A. S. T. M. proceedings. All outside oil samples and special engine test oil samples will be subjected to the Conradson test.

Oxidation Oven—All oil samples both outside and those used in special engine tests will be subjected to tests in both the Waters and Stratford oxidation ovens for the following determinations: (a) Evaporation loss, (b) Petroleum ether insolubles, (c) "Varnish"—resins.

In making a general study of the susceptibility to oxidation of engine oils full consideration should be given to constitution and methods of manufacture of anahydrous switch and transformer oils. The same remark applies to viscous "water-white" oils, such as Squibbs or Nujol medicinal oils.

Standardized Petroleum Ether—In making petroleum ether insoluble determinations it is imperative that the same standardized petroleum ether be used throughout all tests. Spec-

ifications for standardized petroleum ether are as follows:

Gravity, Baumé 77 to 80 (incidental).

Initial Boiling Point—110 deg. to 120 deg. Fahr.

Final Boiling Point—220 deg. to 245 deg. Fahr. Unsaturated content not over 4 per cent (Bureau of Mines method).

Note—Above distillation range determined by Saybolt distillation method.

Volatility—It is desirable to investigate by distillation the volatility of the different compounds contained in lubricating oils. In order to properly make this investigation it may be necessary to determine a part of the boiling point range or the whole of that range.

There are four general distillation methods applicable:

(a) Destructive distillation under atmospheric pressure.

(b) Dry distillation under high vacuum (40 to 50 millimeters Hg.).

(c) Distillation under high vacuum (40 to 50 millimeters Hg.) with the introduction of superheated steam.

(d) Distillation under atmospheric pressure with the introduction of superheated steam.

It is proposed to determine by experimentation which of the above four methods is most applicable to the study of the constituency of lubricating oils with least decomposition of oil and with the most concordant results.

Other Determinations—(a) Sulphur content, (b) ash, (c) fatty oils, (d) acidity, (e) alkalinity, (f) tarry or suspended matter, (g) moisture, and (h) odor.

List of Oil Samples for Examination

Commercial Oils—A two-gallon sample of all available American hydrocarbon oils, intended for the lubrication of internal combustion engines, will be examined for their physical and chemical characteristics. This list of oils will comprise all of those now sold in sealed containers and having reasonable distribution and volume of sales. These oils will not at present be run in the engine tests. It is proposed to purchase these samples at regular intervals, say quarterly, and to retain a four-ounce sample for reference from each of the samples purchased.

Special Oils—The following Liberty Aero Engine Oil Types will be procured and subjected to a complete examination, including engine tests. Specifications for these oils will correspond to the limits prescribed by Signal Corps Specification No. 3501.

Paraffin Base—(1) Lubricating oil made from paraffin base crude petroleum (Penna.) of high boiling point range.

(2) Lubricating oil made from paraffin base petroleum (Penna.) with low boiling point range.

Naphthene Base—(1) Lubricating oil made from naphthene base crude petroleum (Gulf Coast) of high boiling point range.

(2) Lubricating oil made from naphthene base petroleum (Gulf Coast) with low boiling point range.

Fatty Oil Blends—Fatty oil (prime lard) blends will be made with each of the two oils given above under the heading of Paraffin and Naphthene Bases. The physical properties of these blends will be made to correspond to Signal Corps Liberty Aero Oil Specification No. 3501.

The above oils have been selected to determine the difference if any in their lubricating efficiencies in service. Such differences may occur because of different chemical structure or peculiarities of refining processes applied in their manufacture.

If the data from the tests on this list of oils show marked tendencies it may then also be advisable to carefully investigate lubricating oils made from natural mixtures of paraffin and naphthene base crudes (Mid-Continent), or same made from blends of the lubricating distillates from these two crudes at some stage in their manufacture.

Miscellaneous Oils—Various special oils will be used in the study of the effect of processing methods, i. e., acid treatment, sulpho-compounds, etc. Also the effect of filtration to different colors.

(a) Prime lard, (b) sperm, (c) castor oil, cold pressed, (d) rape seed oil, (e) rape seed oil, blown, (f) cylinder stock, low cold test highly filtered, (g) cylinder stock, strained low cold test unfiltered, (h) "paraffin," and (i) acid treated oils.

Regeneration of Used Oils

It is proposed to make a study of commercial processes applied to the regeneration of used oils and to determine what is the best and cheapest means of converting used oils into good lubricants. Also to determine the relative lubricating efficiency of regenerated oils as compared to that of the same oil in its fresh, unused condition.

Problems Involved

1. Removal of solids in suspension.
2. Separation (distillation) of very volatile products.
3. Separation (distillation) of light oils.
4. Removal of heavy oxidized compounds by treating with soda ash and blowing with steam.
5. Removal of moisture.
6. Filtration, Fullers earth.
7. Blending filtered oil to required viscosity if necessary.

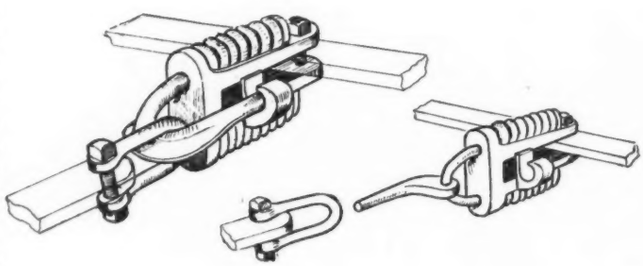
Proposed Samples for Regeneration

1. Used oils made from paraffin crudes (Pa.).
2. Used oils made from intermediate crudes (Mid-continent).
3. Used oils made from naphthene crudes (Tex.).
4. Used oils made from California crudes.
5. Used oils made from blends of hydrocarbon and fatty oils.
6. Slop oils consisting of a mixture of oils and greases.

The Greer Tractor Release Clevis

ERWIN GREER AUTOMOBILE CO., Chicago, has placed on the market a clevis for use in hitching the drawbar of a farm tractor which insures an automatic release of the implement drawn whenever the load is abnormally increased. The sketches clearly show the construction of the device. The pull is transmitted through a single-arm lever, the free end of which is normally held by a hook or catch, which can be adjusted on the clevis. Under the effect of the pull, the two coiled springs are compressed, and when the pull exceeds a certain amount the end of the lever is released from the hub and the implement is automatically detached.

This device is said to be of great value in plowing rocky fields or fields in which there are tree stumps. The position of the hook, which determines the amount of load for which the implement is released, can be adjusted at will. The clevis weighs only 17 lb.



Sketches showing Greer clevis in working position and released

Electric Arc Welder
for Portable and Stationary Use

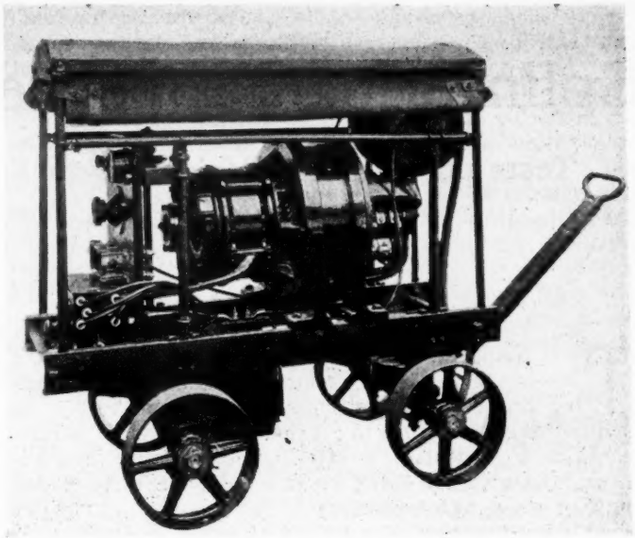
Designed for Operation on Either Direct or Alternating Current Lines, the Alternating Current Outfit Including a Motor Generator Set

AFTER an exhaustive investigation into the requirements of manufacturing institutions, garages and machinery repair shops, the U. S. Light & Heat Corp. at Niagara Falls, N. Y., has developed a line of electric arc welding machinery to meet the requirements for every character of work.

For the smaller shops where it is possible to bring the parts to be welded to within 50 or 75 ft. of the welding apparatus, a stationary type is provided. Where it is necessary to take the electric welding apparatus to the work, a portable type is provided.

The USL arc welder, as the machine is called, has a rated capacity of 4 kw. and gives 200 amperes direct current or less. It is of the variable voltage type, with a range of open circuit voltage from 35 to 65 volts. Tests of the USL arc welder show that it delivers practically constant energy throughout the range of voltage used in welding. This characteristic, together with other special features of design, keeps the arc strong and steady and aids the operator in securing a steady flow of metal into the weld.

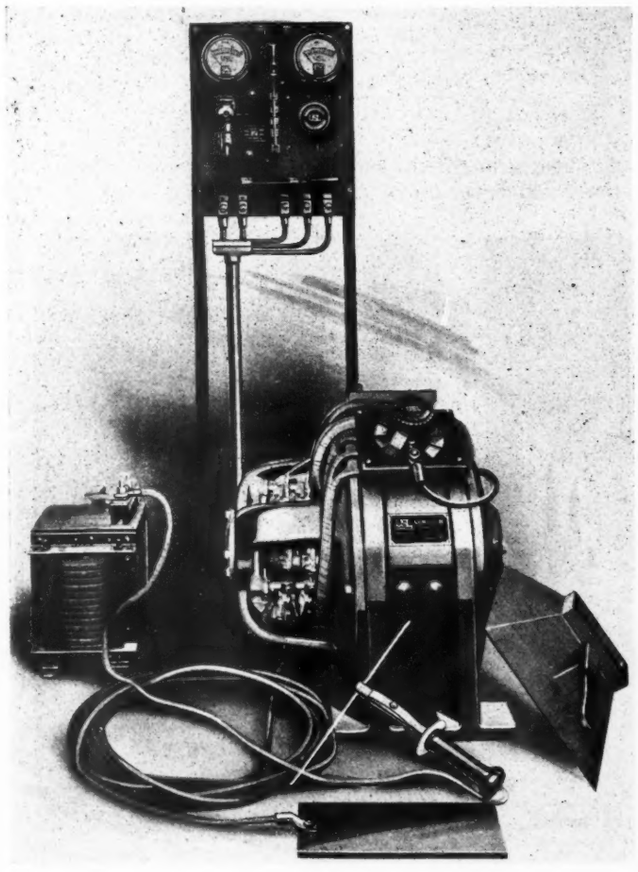
The welder is made in the form of a converter for use on 100 to 125-volt direct-current circuits only, and in the form of a motor generator for all other circuits. The converter is inherently regulated, weighs only 665 lb. and delivers current at the arc through the arc stabilizing reactor with an efficiency of 65 to 70 per cent.



U. S. L. arc welder in portable form

The motor-generator type of welder consists of a 7½-hp. motor mounted on the same shaft with a special 4-kw. generator. This generator is inherently regulated, compound-wound, self-excited, and has a drooping voltage characteristic which keeps the current within safe limits on short circuit. Motor-generator equipments are available in any standard d.c. voltage and in any generally standard a.c. voltage, phase and frequency.

Converter and motor-generator types are made up both for portable and for stationary use. The portable truck with cover is 28 in. wide, 55 in. high and 54 in. long. Completely equipped with motor generator, switch and metal panel, cover, cable reel and flexible cable, it weighs 1530 lb.



Stationary type of U. S. L. arc welder

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Foamy Glues

GLUE which is foamy when spread is likely to give unsatisfactory results, owing to the formation of dry spots in the joints by the air bubbles. Spots as big around as a pea are sometimes thus formed and numerous smaller bare spots are to be found in any joint made with foamy glue. Such breaks in the glue film, of course, weaken the joint appreciably. A loss of 25 per cent has been noted by the Forest Products Laboratory in the shear strength of plywood due to the use of foamy glue, and even greater losses were found when the glue coat was heavy.

Foaming in animal glues may be caused by running the spreader too rapidly, or by running it idle, or by over-heating the glue. Foaming is also dependent on the amount of grease the glue contains, the kind of stock used and the method of manufacture. Alkaline glues are more subject to foaming than glues of acid reaction. Unless a special foamless glue, which most manufacturers are prepared to furnish, is used, or some more desirable preventive measure is taken, the addition of a little grease or oil may allay foaming troubles in animal glue.

Fish oil, corn oil, mineral oil and preparations containing tallow are in use for this purpose.

Foaming in casein glue is commonly the result of mixing at too high a speed or for too long a time. Casein glue mixed at high speed may have twice the volume it would have if mixed at the proper speed, owing to the incorporation of air. Foaming is also caused by improper operation of the spreader. Blood glue has a marked tendency to foam when used in a mechanical spreader. The addition of sulfonated oils has been suggested as a remedy, and it is probable that improvements in the glue formula also will reduce the foaming tendency.

Splintering Properties of Airplane Woods

Tests on Relative Resistance to Splintering Under Rifle Fire, Carried Out at the U. S. Forest Products Laboratory

By G. E. Heck*

THE importance of determining which airplane woods will offer the greatest resistance to splintering under rifle or machine-gun fire can readily be realized when one stops to consider the shower of bullets to which a battleplane is often subjected in an engagement. Other things being equal, an airplane or propeller built of wood which shatters or splinters badly will not give as good service as one built of wood which shows a relatively small, clean-cut hole when struck by a bullet.

The determination of the relative resistance to splintering under rifle fire of some of the most common airplane woods was one of the problems submitted by the War and Navy Departments to the Forest Products Laboratory, Madison, Wis., for investigation during the war.

The laboratory investigation covered the ten species of wood shown in the table, which gives the moisture content and specific gravity of the test panels.

Three Panels Tested

Three panels 15/16 inch by 8 inches by 16 inches of each species were tested, except in the case of the mahoganies, for which four panels were used, two of high-density and two of low-density material.

Model 1898 United States Army rifles shooting 30-calibre, 220-grain, steel-jacketed ball cartridges with an initial velocity of 2000 feet per second were used in the test.

In the first series of tests the panels were placed perpendicular to the line of fire, each panel presenting a target 8 inches wide by 16 inches high. Two bullets were fired through each panel from a range of about 35 yards. The result of one of these shots is marked "S" on Fig. 1.

The second series of tests was similar to the first, except that the panels were inclined 45 deg. to the horizontal plane. The result of one of these shots is shown at "F," in the same photograph.

The third series was made with the panels hung vertically, as in the first instance, but revolved 45 deg. about a vertical axis.

Thus there were three angles at which the bullets cut the grain of the wood—at right angles to the grain, 45 deg. with the grain, and 45 deg. across the grain.

The splintering effect of the bullets on leaving the wood, in typical panels of each species, is shown in the illustrations. Fig. 1 shows a bullet hole in a wood with no splitting and small splinters. Fig. 2 shows one in a wood with considerable tendency to split and form long coarse splinters.

Results of moisture content and specific gravity determinations on test panels based on oven-dry weight and oven-dry volume, are shown in the table.

Average for Each Species Tested

Species	Moisture, per ct.	Sp. Gr.
Sitka spruce	10.5	0.41
Black walnut	12.6	0.58
Prima vera	13.3	0.47
Tanguile	15.3	0.59
White oak	15.0	0.69
Yellow birch	12.3	0.66
African mahogany		
High density	11.0	0.56
Low density	10.5	0.42
Central American mahogany		
High density	9.5	0.51
Low density	13.0	0.36
White pine	9.6	0.36
White ash	11.9	0.64

Observations show that the ten species may be divided into two groups—one in which there was very little or no splitting, or in which the splinters formed were short and fibrous; and the other in which the wood showed a de-

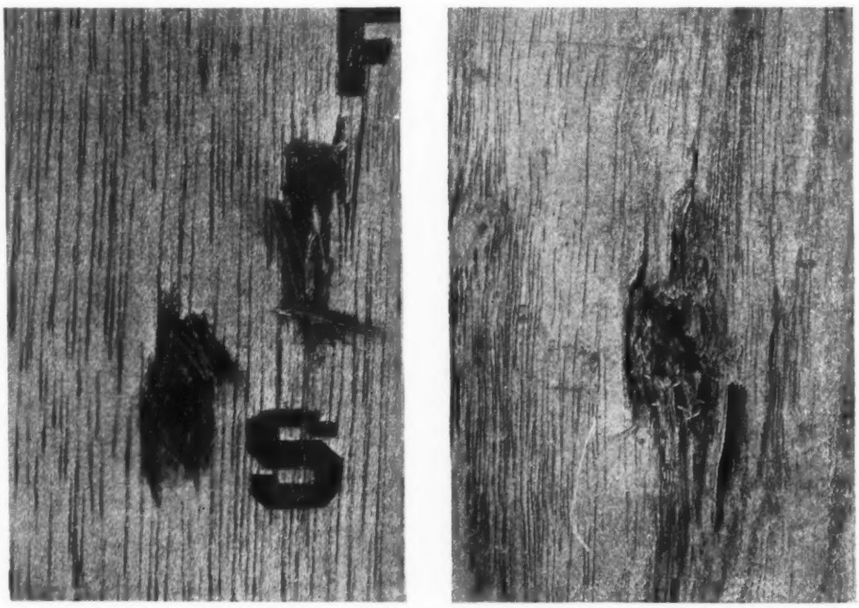


Fig. 1—Left—Bullet holes showing small splinters and no splitting. Fig. 2—Right—Bullet hole showing large splinters and tendency to split S—Line of fire perpendicular to grain; F—Line of fire 45 deg. with the grain

*Engineer in Forest Products, Forest Products Laboratory, U. S. Forest Service, Madison, Wis.

cided tendency to split, or in which relatively long coarse splinters were formed.

The two groups are as follows:

GROUP 1	GROUP 2
Woods with No Splitting Tendency	*Woods with Decided Splitting Tendency*
Tanguile,	Black walnut,
Yellow birch,	Sitka spruce,
Prima vera,	White oak,
White pine,	White ash.
African mahogany,	
Central American mahogany.	

A tendency of the wood to crack or split is indicated on the photographs by a dash under the letter designating the bullet hole.

There was apparently very little difference in the splintering effect due to the change in the angle at which the bullet entered the wood. All the panels had holes of irregular outline, and splinters of various sizes formed on the back surface where the bullets pierced the wood.

The African mahogany panels seemed to offer a greater resistance to splitting than the white oak. The splinters of the latter species were long and coarse, while those of the former were short and fibrous.

There was no apparent difference in the relative resistance to splintering between high and low-density mahogany. No comparison was made between high and low-density specimens of the other species.

Although black walnut was placed in group 2 on account of the tendency to split, the splinters formed were small and the bullet holes were not so large as those of the other species in this group.

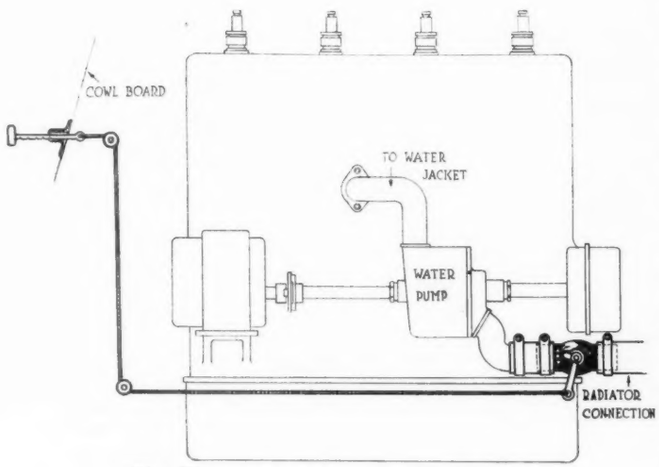
White ash seemed to split the worst and formed large splinters. The largest holes were made in the panels of Sitka spruce, although this species did not seem to split so badly as white oak and white ash.

The "Flocontrol" Cooling Regulator

TO provide an efficient, yet an inexpensive means of controlling the temperature of the engine regardless of the climate or load conditions, the Fulflo Pump Co. of Blanchester, Ohio, manufacturer of the Fulflo water circulating pump for engines and Fulflo lubricant pumps for machine tools and grinding machines, is marketing a new device sold under the trade name Flocontrol.

The Flocontrol enables the driver to regulate the flow of water through the engine and radiator, giving him control of the engine temperature. It is so arranged that the flow can never be completely shut off, a slight circulation being always maintained through the radiator, thereby preventing freezing in cold weather and the possibility of the engine heating too rapidly. The manufacturers argue that on cars equipped with a Motometer the driver has a means of telling when his engine is too hot or too cold, but he has no means of remedying the condition. Installation of a Flocontrol enables him to regulate the flow of water in accordance with the indications of the Motometer.

The Flocontrol is made in several standard sizes, so that it is applicable to any make or model of truck, tractor or passenger car. In order to install the device, it is only necessary to cut a small section out of hose connection between the radiator and the pump and insert the Flocontrol, attach the metal cords and run the cord to and attach it to the dash regulator.



The Flocontrol—diagram of installation

The device is furnished complete, consisting of the valve, regulator, necessary metal cords, eyelet screws and hose bands. It will also be furnished to manufacturers, arranged for direct connection to the water pump intake.

German Engineers in Conference

FOR the first time delegates from all the engineering institutes, trades and schools in all parts of the Empire except the occupied districts met in conference at Eisenbach recently. Among those who attended were the postmaster general, the president of the Württemberg Technical Association, the presidents and delegates of the great mining technical organizations, and representatives of the German Engineers' Association, the Electrical Engineers' Society, various chemical associations, the Society of Architects, the Railway and Postal Technical Officials, etc. The conference is a result of the revolution, which brought to realization the long-entertained plan of a meeting of the entire German technical interests.

The conference proceeded to settle its organization, especially the constitution and by-laws. It recommended that technical knowledge should have some part in all school programs of study, and that in the high schools of other professions some instruction in technical affairs should be given; further, that the people should be made familiar with the working and importance of technical ideas for economy and culture, and technical experts of the necessary personal capability and knowledge should have a greater share than before in the work of public bodies with the powers of full members.

The association will also undertake to further the civil rights of its members and adherents. It has already achieved success, in that among the members of parliament elected since the revolution the number of engineers has increased tenfold. These have been in many cases consulted by the Foreign Office in the consideration of the peace conditions, and their influence is on the increase. The limits of their competence were, however, clearly recognized by the conference, and the statement was applauded that great questions must not be regarded only from the technical standpoint. Great anxiety was evinced over the terms imposed by the Entente for the prolongation of the armistice, and the conference passed a resolution for transmission to the Government and National Assembly in Weimar, pointing out the great dangers of such concessions as the handing over of locomotives and agricultural machines, and asking that such pledges should not be made without previous consultation of the technical experts.

Class B Rules for Tractor Tests

The American Society of Agricultural Engineers Drafts Plan to Make Data Gathered at Field Trials Comparable and of Educational Value to All Branches of Industry

THE American Society of Agricultural Engineers has drafted two sets of tractor demonstration rules. The society is working to bring about uniformity in tractor demonstrations and to make these demonstrations productive of figures that will be of value to both the manufacturer and the user.

In its statement the society says:

"The object of these rules, instructions and data is to make all tractor demonstrations of this kind comparable and of educational value. Any one who has conducted tractor demonstrations in the past has realized the necessity of some standard rules to follow, and those who afterward have referred to the results deplore the lack of uniformity in the demonstrations and the data.

"The value of these demonstrations depends largely upon the accuracy of the data reported on both the conditions and results. The fuel consumption per acre, for instance, is much more interesting when the condition of the soil is known, and this varies so often in the same field that the conditions for each tractor should be carefully considered and specified in the data.

"Fuel tests should not be undertaken unless the work is under the direction of a competent engineer, and preferably representatives of the Agricultural Engineering Department of the State Agricultural College."

The Class B rules, which are printed herewith, are designed to govern State or national demonstrations conducted by manufacturers, distributers, dealers, agricultural institutions and county agricultural agents. The society also has drafted Class A rules, which are designed to govern demonstrations of a more local character. Copies of these rules will be supplied upon request to F. W. Ives, secretary of the American Society of Agricultural Engineers, Ohio State University, Columbus, Ohio. The rules are copyrighted by the society.

Data Sheet for Tractor Tests—Class B

Place of test ..... Date .....

TRACTOR DATA

Name and model of tractor ..... Serial No.....
Make of plow .....No. of bottoms.....
Size ..... Type Ben. Purpose .....
Stubble ..... Sod.....

FIELD DATA

Kind of soil .....
Condition: Wet.....; Moist.....; Dry.....
Character of land: Level.....; Rolling.....
Previous crop grown .....

PLOWING DATA

Length of field (headland to headland), ft. .....
Width (edge to edge of furrow, less width of land plowed before test), ft. .....
Note—All lands for economy tests to be within 10 per cent of the same length. (See instructions.)
Average depth of plowing.....
Total area plowed, acres .....
Total time of plowing.....hr.,.....min. Time out.....min.
Duration of test .....hr. .....min.
Rate of travel ..... ft. per min.
Gal. of kerosene used..... Gal. of gasoline used.....
Sp. gr. of fuel gas..... Kerosene .....
Water used: Radiator .....; Engine .....
Fuel used per acre:
Gasoline ..... Cost of fuel per gal.....
Kerosene ..... Cost of fuel per gal.....
Average drawbar pull, lb. .....
Average drawbar horsepower .....
Drawbar horsepower to be based upon rate of travel during fuel test.
Fuel used per drawbar horsepower hours .....gal.

Rules for Maximum Brake Test

Rules 1 and 2—Governing plowing tests of Class B, apply also to this test.

Rule 3—Time—Each entrant will be given two hours, if necessary, in which to make adjustments and trials before starting the brake test. Duration of brake test will be two hours' continuous running.

Rule 4—Fuel—The same fuel used in plowing test must be used in this.

Rule 5—Speed—The belt pulley should be run within 10 per cent of its rated speed.

Rule 6—Equipment—(a) Prony brakes will be used which will all be of the same design and will be calibrated before the tests. These brakes will be of approved design, water cooled, equipped with a continuous revolution counter and well mounted.

(b) The belts furnished will be 5 and 6-inch rubber belts 80 ft. long, and 7 and 8-inch rubber belts in 100-ft. lengths, and will be furnished by the committee.

Rule 7—Altitude and Temperature—All results will be reduced to a basis of 14.7 lb. barometric pressure. All results will also be corrected to atmospheric temperature of 70 deg. F.

Rule 8—Rating—The rating recommended for the tractor will be based upon the results of this test; 90 per cent of the horsepower developed throughout the test will be the recommended A. S. A. E. rating.

Rule 9—Re-entry—If an entrant is disqualified for any reason, he may apply for another trial. Such request must be made immediately.

Note—Any necessary interpretation of all rules will be made by the committee in charge of the test.

BRAKE DATA

Place of test ..... Date.....
Name and model of tractor..... Serial No.....
Fuel: Gasoline .....; Kerosene.....
Sp. gr. of fuel gas ..... Kerosene.....
R.p.m. of belt pulley .....Pulley diameter.....
Pulley Face.....
Brake horsepower sustained .....
A. S. A. E. recommended belt rating (90 per cent of 2-hr. max.) .....
Test Committee—
..... Chairman
..... Brake
..... Data

Rules for Plowing Tests

Rule 1—Assignments—The company's representative should report for assignment to the committee in charge of tests upon the arrival at the ground. (Note instruction 3-B.)

Manufacturers must have tractors ready at the time assigned them or forfeit the privilege to that test.

Rule 2—Entries—(a) Only one tractor of each model of the same make may be entered.

(b) All tractors entered for test to be stock machines as regularly sold.

(c) Each tractor should carry a prominent placard 20 in. in height and 30 in. in width. If other size is used, dimensions should be of similar proportions.

Rule 3—Duration and Time of Test—Duration of all economy plowing tests will be four hours. The time for the tests will be set by the committee and company representative when assignments are made.

Rule 4—Position on Fields—The entrant will draw for his position on the field. The plots will be numbered, and the number drawn entitles the entrant to the plot bearing that number.

Rule 5—The Field—All lands will be of uniform length, and the width will be determined and marked before the test.

The entrant will not be required to finish his land as a part of the test. Special care will be used in selecting the fields for tests that all conditions will be as nearly uniform as possible.

Rule 6—Draft Test—Two preliminary rounds will be made to adjust the outfit. In the third round the average draft will be recorded with a dynamometer, after which the test will start. Following the four-hour run, another dynamometer test will be made, and the average of the two will be taken as the draft during the economy test.

The draft as was shown by the dynamometer will be reduced to the actual resistance in the direction of the line of travel. The angle of the dynamometer unit will be determined with a suitable geniometer.

The drawbar horsepower will be based upon the draft as obtained above and the average rate of travel taken during the plowing period. A dynamometer record should be secured for the complete round.

Rule 7—Fuel—The test should be made only on one fuel. This will eliminate the necessity of including more than one fuel in the final results. The fuel level in the tanks will be measured just before starting the test, and at the end of the test the fuel used will be determined. (See instructions.) The fuels commonly used in the particular locality in which the test is held will be supplied the entrants from one source. The lowest type of fuel available for which the tractor is recommended by the manufacturer should be used in the test.

Rule 8—Water—The water used in the radiators will be measured by the same method as used in measuring the fuel. If water is used in air washer or with fuel, it will be kept separate from the water used in the cooling system.

Rule 9—Travel—The rate of travel should be within 10 per cent of the speed at which the tractor is entered. This speed is to be maintained throughout the test.

Rule 10—Plows—The same plows with the same hitch and adjustments are to be used throughout the test, and no one will be allowed to handle or adjust the plow other than the operator of the outfit.

Rule 11—Depth—The depth is to be checked every 10 rods by the A. S. A. E. (Heylman) depth gage.

Rule 12—Width—The width cut by the plows should be checked at least every other time the depth is taken, and the operator should be made to maintain a uniform width of cut.

Rule 13—Delays—If it is found necessary to stop the tractor due to tractor trouble more than 30 min. in the aggregate the test is annulled.

Rule 14—Re-entry—If an entrant is disqualified for any reason, he may apply for another trial. Such request must be made immediately.

Rule 15—Data—All data will be the property of the individual manufacturers and of the test committee of the A. S. A. E. and it will be made public, unless the manufacturers desire to withdraw the results, and then no part of such data may be issued later. No partial data from any one test may be used as A. S. A. E. data unless the entire results of that particular test are published.

Note—Any breach of rules disqualifies the entrant. Interpretation of all rules and questions not covered by the rules shall be made by the committee in charge of test. (See instructions which cover and form part of these rules.)

Instructions for Conducting Tractor Plowing Tests

1B—Each company should place one man in charge of its interests in the tests who will consult with the test committee for assignments not later than one day before the time of the first test. The time for the tests and position in the field will then be assigned. Entrant must have his machine in the field ready to start the test at the time allotted, or forfeit the privilege to that particular test.

2B—(a) Only one tractor of each model of the same make may be entered for the same test. (b) All tractors entered for the tests must be stock machines as regularly furnished the trade. No special attachments or accessories will be used that are not regularly furnished with the machine. (c) Each tractor should carry a placard giving the following information:

Name ..... Rating.....
No. of cylinders ..... Bore..... Stroke.....
Normal Engine r.p.m. ..... Travel.....M.P.H.
Travel.....M.P.H.
Travel.....M.P.H.
Fuel .....

The rate of travel at which the tractor is entered in the demonstration should be given in bold figures in the upper space; the other speeds, if tractor has more than one speed, in small figures in the lower space.

3B—To get any reliable and comparable data, it is necessary to have the tests of the same length. Experience has demonstrated that short tests are seldom satisfactory and results have little meaning to the practical man, hence tests of four hours are recommended. The time for the tests will be arranged by the company representative and the committee at the time of assignment.

4B—The entrant will draw for his position in the field at the time assignment is made. The plots will be numbered and the number drawn entitles him to the plot bearing that number. Special care will be used in selecting the fields for tests so that all conditions will be as nearly uniform as possible.

5B—The land will be laid out with headlands of sufficient width for turning and all lands will be within 10 per cent of the same length. This is done in order to place all tractors as nearly as possible on the same basis.

Stakes will be set up at both ends to indicate the starting line and the entrant may place as many intermediate stakes as he desires. He will be required to make a straight furrow in starting out and should maintain an even width throughout the test.

6B—Two preliminary rounds will be made to adjust the outfit. The dynamometer will be used the third round and the average draft will be recorded. Following the outfit on the third round, the observer will place at intervals of ten rods small stakes to mark the inner edge of the furrow bottom.

A link of equal length to the dynamometer unit will be placed between the plow hitch and tractor draw bar so the plow adjustment will not be disturbed when the dynamometer is used.

At the end of the third round, the dynamometer will be disconnected, the fuel measured, and the test started. The final

(*Continued on page* 1251)

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The Automobile

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Air Development

EVERY support should be given to the attempt of the Army Air Service to develop aviation in the United States by its proposed plan to establish landing fields in thirty-two important cities reaching from coast to coast.

It is argued that the military authorities cannot have a commercial viewpoint and will build fields chiefly from a military conception, and that this may harm commercial aviation rather than further it; but any steps that will awaken public interest and recognition of commercial aviation are important, and there are no other government departments at this time that can do so much as the Air Service.

The only other department is the Post Office, which has not the power necessary for large development of commercial air routes and which lacks the initiative of the Air Service.

The Air Service probably will establish fields that are not logical for commercial usage, and even in some instances, after awakening public interest and expenditure of public funds, cause some revulsion of feeling by more or less impractical work; but this will be better than to allow aviation completely to revert to its pre-war state and require a long, slow process of evolution.

This matter of the control and regulation of aviation is one that should receive early consideration by the next Congress. There should be a department of aeronautics to control aviation under charge of a cabinet member so that the problems may be handled by one organization, which will make for consistent decisions.

Exchange and Credit

THE American manufacturers who are entering the export business are confronted with many extraordinary conditions. Not the least of these is the credit situation—always a matter for serious consideration in foreign trade.

The present complication of that situation is the high rate of exchange. This is one of the results of the long war period and the general upset of financial conditions. Foreign buyers naturally do not like to pay for their goods at the present rate of exchange. Most of the buyers in other countries feel that the rate of exchange will be adjusted within the year and that when this adjustment is brought about they would be burdened with merchandise paid for under the abnormal rate, which would be an important factor in computing their profits.

Bankers who have followed the exporting trade for years are suggesting that under present circumstances unusual credit extended the reliable firms would be a strong inducement to them to place large orders. If the credit were made 9 months or a year, the customer would feel that the exchange rate adjustment would come within that time and that he were on the same basis as firms that might buy later. This phase of the credit situation is presented without relation to other credit reasons or practices.

A successful exporter of lumber to South American countries was asked some months ago how he had succeeded where so many had failed. He answered: "I have always tried to adjust my collections to low exchange periods. A South American merchant greatly appreciates an extension when exchange is high, and most of my customers shorten their credit period of their own accord if exchange drops to a low figure. Especially is this true since they have learned that I make every effort to adjust my end of the credit to the exchange rate. Before the war my customers were shortening credits about equal to the extensions I granted."

At the time of this conversation the present situation did not obtain, but the practice mentioned was developed merely as a "good business policy." Foreign merchants, especially those in Latin America, respond to such favors.

Tractor Demonstration Rules

THE publishing of tractor demonstration rules by the American Society of Agricultural Engineers, and also the publication of the rules governing the British Tractor Demonstrations for this year, suggest the prime importance of tractor demonstrations which shall furnish data that are of use not only to manufacturers but to the entire tractor industry.

Heretofore American tractor demonstrations have been practically useless and valueless from an educational point of view. The national tractor demonstrations have been mere exhibitions of plowing and tilling.

The agricultural engineers are to be congratulated on drafting what is known as their Class A rules, which are good, but do not go far enough. In some instances these rules check up sufficiently well with the British rules to give them an international significance; but in other respects the British rules are more embracing and will furnish more educative data.

The American and British rules agree in plowing demonstrations extending over a number of hours. The British insist on 5 hours plowing per day, whereas the A. S. A. E. (American Society of Agricultural Engineers) rules call for 4 hours plowing per day. Either is immeasurably superior to 2 and sometimes 3 hours of plowing, as has been the custom heretofore at national demonstrations.

If space is available, there should be plowing from 8 o'clock in the morning until 6 in the evening. This would give a clue as to the strain of the tractor on the operator, which is a very important matter, and one not considered by any existing rules.

The British tractor rules require an observer to attend each tractor throughout its performance and in this respect are superior to the American rules. The object of the observer is not only to secure an indisputable report on the tractor performance and tractor stops, thus providing valuable data, but also to insure fair rulings in every possible way.

The British rules are commendable in that they allow 1 hour for refilling tanks, oiling, and repairing each day. The repairing, if done by the operator, does not result in penalty to the machine, but if outside assistance is needed the tractor is penalized on a man-minute basis, the assumption being that additional help costs the farmer money, and in an official demonstration made for commercial purposes only, such added cost should count against the score of the tractor.

The practice of letting the tractor be taken at night to the headquarters of the manufacturer where it can be repaired, adjusted, or refitted, as necessary, is not permitted under the British rules, the assumption being that the public has a right to be told the entire story of what has had to be done to the tractor during the demonstration. This is sound logic.

It is scarcely ethical to publish a fifty report when it really should be a fifty-fifty one. If we tell the exact performance of the tractor, we should also tell the work that must be done on the tractor during the demonstration to make this performance possible.

Tractor accessibility is not sufficiently recognized in either the American or British rules. Under the British regulations it may come to the surface in that repairs only be made in the 1 hour; and under the American rules, the provision is that the tractor is disqualified if more than 30 min. are needed for tractor troubles during the test. We do not think a 30-min. period is a fair test. No piece of machinery is perfect, and picking out an arbitrary time limit, which, if exceeded, results in disqualification, is a dangerous policy to follow. Why not follow the British policy of penalizing on a man-minute basis?

One commendable feature in the British rules is that limiting the warming up or starting period of the engine for 10 min. The farmer has learned that whether gasoline or kerosene is used in warming up the engine or in plowing, the net result on his pocketbook is the same.

The question of arranging blanket speed rules for plowing, and requiring that a tractor must plow within 10 per cent of its rated speed, is a difficult task. It is one thing to plow at a rated speed on the 320-acre field of Kansas, and another thing to plow at the same speed on hilly ground in Pennsylvania, where there is a goodly proportion of stones.

It will not be possible successfully to use the A. S. A. E. rules in all states in the Union and have the same speed regulations, as demonstrated in many of the tractor trials last year.

The Class B, A. S. A. E. rules as they are officially known, are recommended for demonstrations by manufacturers, distributers, dealers, agricultural institutions, and county agricultural agents. They do not place any time limit on the demonstrations outside of the 4-hour plowing period. It is hoped that the demonstrations will at least occupy 2 days.

Latest News of the

Revised Tax Rulings Issued

Treasury Dept. Makes Changes as Result of Protests of N.A.C.C., N.A.D.A. and Other Associations

WASHINGTON, June 2—As a result of numerous protests from the National Automobile Chamber of Commerce and the National Automobile Dealers' Association and other bodies, the Treasury Department has issued new rulings relating to some of the excise taxes on cars, trucks and parts. The tax on tires, accessories and parts does not apply when sold to the manufacturer or producer of passenger cars, trucks or motorcycles for the sole purpose of being used in their manufacture or for sale as a part of the manufactured product. In all such sales, however, it will be necessary for the purchaser to furnish a certificate showing that the parts or tires will be used as prescribed.

The ruling on chassis, whereby all chassis were classed as passenger cars and taxable at 5 per cent, has been changed, and any chassis with a superstructure that will allow its use as a truck without any substantial additions is regarded as a truck and taxable at 3 per cent. All other chassis, however, remain taxable at 5 per cent.

Under the original regulations a manufacturer, who is also engaged in retail business, was allowed to base his tax on the average monthly wholesale price. Under the new regulations, where it is impracticable to follow this plan, the taxpayer can base his tax on the ordinary regular wholesale price for which like articles were sold in the month previous.

When tires are returned for replacement, due to the fact that they have not traveled the guaranteed number of miles, a tax on the replacement is figured on the actual price of the transaction.

Following is the complete amendment:

EXCHANGES PURSUANT TO GUARANTY.

Where any article taxable under Section 900 is returned to the manufacturer thereof, for adjustment, replacement, or exchange, under a guaranty as to quality or service, and a new article given pursuant to a guaranty, free or at a reduced price, the tax shall be computed on the actual price, if any, to be paid to the manufacturer for the new article.

Article 14 of Regulations No. 47, entitled "Tires, inner tubes, parts, and accessories sold to manufacturer" is hereby modified to read as follows:

"Subdivision (3) Section 900 of the Act exempts from tax sales of tires, inner tubes, parts, or accessories to a manufacturer or producer of automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories. To come within the exemption the sale must be to such a manufacturer for use by him in the manufacture or production of automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories or for sale by him on automobile trucks, automobile wagons, other automobiles, or motorcycles or in connection therewith or with the sale thereof or for free replacement under contract or guaranty. If sold to such a manufacturer for any other purpose, such as resale to a dealer or for the rebuilding of used cars, the sale is taxable. In order for the sale to come within the exemption of the statute, the manufacturer must at the time the goods are shipped or sold (whichever is prior) have in his pos-

(*Continued on page* 1252)

Work on Wills-Lee Plant Starts

Expected to Be in Operation by Fall—Design of New Car to Be Announced Soon

DETROIT, June 3—Work will start at once on the first three units of the automobile plant to be built here by C. Harold Wills and John R. Lee, former Ford executives. The units will each have a length of 1000 ft. Construction plans will be rushed and it is hoped to have a complete plant in operation by fall.

It is expected that the new organization will announce the design of its new car within the next 60 days. Reports are that the machine will sell at between $1,200 and $2,000, and will be a light 6-cylinder machine, embodying many new features in body and engine design. Mr. Wills has been working on the car for several years and he states that experimental machines have been driven as much as 180,000 miles.

It is said that many of the ideas of the Hispano-Suiza car have been adopted by Mr. Wills and that he controls a number of the American patents on the French car. It is also rumored that the new Wills engine is exceptionally light, and that it is air cooled.

The construction of a self-contained factory, as outlined by the promoters, will entail an investment of millions. There are many who believe that Henry Ford is directly interested in the new enterprise, although this is doubtful. Both Wills and Lee have been close to Ford, having left that organization but a few months ago.

In Port Huron it is reported that Wills and Lee have invested $1,000,000 in the 2000-acre factory site. A big portion of this site they have purchased outright and have taken options on the rest of the land, which is located on the St. Clair river three miles below the city.

John R. Lee has purchased a residence in Port Huron and will move there at once to superintend the construction work.

German War Trucks Are Brought Here

Col. Slade of Armistice Commission Has 47 Surrendered Vehicles at Baltimore

NEW YORK CITY, June 2—Lieut. Col. A. J. Slade of New York City, who was a member of the Permanent International Armistice Commission with headquarters at Spa, has returned to America and expects to be discharged within a few weeks. Col. Slade, who, previous to going to France, was in engineering work, was the representative of the A. E. F. Motor Transport Corps on the Armistice Commission. He had to do with making definite arrangements for the handing over of the 5000 German trucks, 1250 of which were turned over to the Americans. These 1250 were placed in parks and over 300 of them immediately put into reconstruction work. All were fitted with steel tires. Col. Slade selected types of the principal makes and had a very complete technical report of them prepared. He has brought 47 of these trucks to America and they are at Baltimore, where they are awaiting complete technical inspection by a committee appointed by the Motor Transport Corps.

Driver's Cab a Feature

In fitting these trucks with steel tires the speeds were cut down to approximately 8 m.p.h. and improvements made in the spring suspension. The use of supplementary spiral springs is very general in them. Many of the trucks are fitted with narrow dual steel tires. A characteristic of these German trucks, and one in which they greatly surpass American trucks, is the cab equipment for the driver. On all makes this is particularly complete.

In general the trucks are of the 4-cylinder type, a few of these using block castings, but the majority with twin castings. Valve-in-the-head construction is used in a few cases. Cone clutches, 4-speed gearboxes, and chain drive are characteristic of practically all. The Germans gave more attention to frame construction than is general in American truck practice. The majority of the frames are bottle-neck pressed-steel designs.

F. W. HENNINGER DIES

DETROIT, June 3—Frederick W. Henninger, 46 years old, president of the Sheet Metal Stamping Co. and vice-president of the Bellevue Mfg. Co., died here Friday morning.

Automotive Industries

Overland Factory Shut After Riots

General Manager Earl, in Statement, Says Union Leaders Promoted Attacks

TOLEDO, OHIO, June 4—Rioting at the Willys-Overland plant last night which resulted in killing of two men and injury to scores of others caused the company to close down to-day, and it will remain closed for an indefinite period. A mob, several thousand strong, attacked loyal workers as they were leaving the factory last night.

Guards fired into the crowd and a fight followed.

Mayor Schreiber of Toledo declares the city is powerless to further protect the factory. He has appealed to Governor Cox for troops and it is expected that Toledo will be placed under martial law.

During the day there were three riots. Early street cars carrying loyal employees to the plant were attacked, windows smashed with bricks and passengers pulled into the street and beaten.

C. A. Earl, first vice-president and general manager of Willys-Overland, ordered the plant closed. Work was resumed a week ago after two weeks of idleness and, until the outburst yesterday, the situation was thought to be well in hand.

In a statement to AUTOMOTIVE INDUSTRIES, Mr. Earl charges union leaders with responsibility for rioting.

His statement follows: "The Overland plant will be closed to-day at the urgent request of the mayor, as a result of rioting. Toledo faces the most critical hour of her history. She is squarely face to face with the question:

"Shall American citizens, residents of Toledo, exercise their constitutional rights to earn an honest living, or shall violent, irresponsible thugs drive thousands of workers from their work, and dominate the city with brutal and murderous intimidation?

"The riots occurred at exits and entrances of the plant and at street car transfer points. Strikers even attacked the office building and its occupants. Last night many were injured and two were killed in an attack made in the home district of our Polish employees.

"These mob attacks have been credited by some newspapers to disorganized men and I. W. W. The public should know that men hiding behind these cowardly attacks on women and old men are leaders in the machinists and other unions, who, by their speeches and advice to the men, have stirred up and created this condition. The blood of the dead and injured men and this disgrace to Toledo are on their heads.

"The condition demands that we must go to the limit in doing what is required to meet the situation."

—

Gas Warfare Talk at S.A.E. Summer Meet

NEW YORK CITY, June 5—Gas Warfare will be the subject of the Wednesday evening lecture at the summer session of the S. A. E. at Ottawa Beach, June 25. J. Johnston, Professor of Chemistry at Yale University, who has had a great deal to do with the development of gases for war uses, will speak. This, coupled with the lecture on wireless telephony, with demonstrations on Tuesday evening, June 24, gives an importance to the summer sessions that has not been present in former years.

It is very probable that there will be an exhibit of German trucks which have been brought to America by the Motor Transport Corps, and which will be shipped to Ottawa Beach.

Commander J. C. Hunsaker will give an address on the progress of naval aircraft. Another paper added to the program is that by H. Heindlhofer on tests of truck axle and worm bearings.

Total reservations to date are 515.

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325,000 TONS OF STEEL FOR G.M.C.

NEW YORK, June 5—The placing of an order for 325,000 tons of steel by General Motors Corp. has been confirmed by Judge Gary, chairman of the United States Steel Corp. This is one of the largest orders placed since the signing of the armistice, and the purchase is for the subsidiary companies of the G.M.C. The exact tonnage of various kinds of steel has not been announced. It is understood that the stabilization prices govern the sale.

It is said that Willys-Overland, Inc., has placed a large order for steel.

—

MAXWELL-CHALMERS PLANS

NEW YORK, June 5—A meeting was scheduled for to-day at which final details of the Maxwell-Chalmers merger plan were to be worked out, preliminary to the making of an announcement as to what these plans are. The postponement of the meeting will, however, delay the announcement, which it is now expected will be made within the next week.

—

WHITING OF BUICK IS DEAD

FLINT, June 3—J. H. Whiting, who brought the Buick Motor Car Co. to Flint, 16 years ago, died Monday morning in New York City.

1920 Show Dates Fixed by N.A.C.C.

New York Exhibit Jan. 3-10—Chicago, Jan. 24-31—Truck Shows Same Dates

NEW YORK, June 5—The New York Automobile Show will be held Jan. 3-10, 1920, in the Grand Central Palace. The Chicago show will be held Jan. 24-31 in the Coliseum.

Truck shows will be held in both cities on the same dates. The place of the New York show has not been decided upon, but the Chicago show will be held in the Drexel Pavilion, in the stockyard section. S. A. Miles will again be manager of both shows.

These dates were decided upon by the directors of the National Automobile Chamber of Commerce yesterday. The members of the N. A. C. C. met to-day and will decide upon details concerning the shows. C. C. Hanch, who has recently returned from Europe, addressed the members.

An export managers convention will be held to-morrow.

—

GAS ENGINE ASSN. MEETING

CHICAGO, June 3—The National Gas Engine Association, at to-day's session, adopted the new constitution permitting of sectional organization.

The following officers were elected for the ensuing year: President, L. A. Ward, Cushman Motor Co., Lincoln, Neb.; first vice-president, T. C. Menges, Associated Manufacturers Co., Waterloo, Iowa; second vice-president, Henry Kennedy, Lally Electric Light Corp., Detroit. The executive committee is composed of J. F. Richards, Alamo Farm Light Co., Hillsdale, Mich.; F. E. McKee, Manning, Maxwell & Moore, New York City; George Cormack, H. C. Dorman Co., Oshkosh, Wis., and the presidents of subsidiary sections, who automatically become members of the executive committee. H. R. Brate, secretary of the association for a number of years, handed in his resignation. The subsidiary sections will report on their organization later.

—

TRUCK AUCTION DELAYED

WASHINGTON, June 3—The War Department announces that delays incident to the inventorying of its stock of surplus motor equipment which has been found to be unsuitable for Government use, will necessitate a postponement until after June 15 of the public auctions of used passenger and commercial cars, which had been announced for June 1.

Michigan-Ohio Output Hit by Strikes

May Daily Production Fell 396 Cars Below April — Labor Trouble Responsible

DETROIT, June 2—Daily car production figures for Michigan and Ohio during the month of May follow:

Car	April	May
Buick	500	500
Briscoe	75	75
Barley	10	10
Cadillac	100	80
Chalmers	80	80
Chandler	60	70
Chevrolet	700	726
Columbia	18	20
Dodge	500	500
Dort	100	100
Ford	3000	3000
Harroun	15	15
Hudson	100	100
Hupp	75	60
King	10	10
Liberty	30	30
Maxwell	250	250
Olympian	10	12
Oldsmobile	140	150
Overland	600	200
Packard	25	25
Paige	70	75
Paterson	15	15
Jordan	12	15
Reo	125	125
Saxon	50	35
Scripps-Booth	45	50
Studebaker	200	150
Winton	10	10
Essex	100	100
Grant	50	50
	7084	6688

Car production in Michigan and Ohio during May was hard hit by labor trouble, statistics revealing a falling off in the daily production of many factories. During the month daily production averaged 6688 cars as compared with 7084 produced daily during April. Strikes in the plants of parts makers were largely responsible for the subnormal production, although in the cases of Willys-Overland and Studebaker No. 3 factory, Detroit, the strikers effectively tied up manufacturing work.

Saxon and Hupp Also Affected

Saxon, Hupp and others were hit by the Wilson Body Co. strike, which curtailed the supply of bodies. The walkout at Timken-Detroit Axle Co. hampered Cadillac and one or two other companies, and the Salisbury Wheel & Axle Co., Inc., strike at Jamestown, N. Y., if it develops seriously, is threatening Paige production. The Willys-Overland Co., which was running 600 cars daily at the time of its strike, has not produced a car in three weeks. Studebaker production was affected by a walkout, but to just what extent is not known at this time.

All of the car makers are oversold, some of the companies, as the Jordan Co., Cleveland, having sold its entire production for the next eight months.

—

75 PAIGES A DAY

DETROIT, June 2—May production at the Paige-Detroit Motor Car Co. averaged approximately 75 cars daily. The high mark was 110 machines in one day and the low mark 40 completed cars. The plant's normal capacity is 100 machines daily, but this figure will not be reached before August. The company has orders for five times more cars than can be produced.

—

JORDAN MAKES 15 A DAY

CLEVELAND, June 2—The Jordan Motor Car Co. has run up its production to 15 cars daily, with its entire output for the next eight months sold in advance. The company will produce 4000 cars this year and hopes to have its new factory in operation by July 15. Work on the new plant is now under way.

—

1020 SCRIPPS-BOOTHS IN APRIL

DETROIT, June 2—The Scripps-Booth Motor Car Co. produced 1020 cars last month, working on a basis of 22 days to the month.

—

500 BUICKS A DAY

FLINT, MICH., May 28—The Buick Motor Co. is not yet back in normal production. The plant is turning out between 450 and 500 cars daily. While some difficulty has been experienced in getting certain parts, this situation is rapidly clearing up.

—

ROAMER ORDERS

KALAMAZOO, MICH., June 2—The Barley Motor Car Co., maker of the Roamer, is 500 orders ahead of production. The company is running between 6 and 10 cars daily, but is having some trouble getting a steady supply of bodies. The plant is now employing approximately 200 men.

—

15 OLYMPIANS DAILY

PONTIAC, MICH., June 3—The Olympian Motor Car Co. is producing 12 cars daily and is preparing to increase this production to 15 cars at once.

—

FEDERAL TRUCK PRODUCTION

DETROIT, June 2—The Federal Motor Truck Co. is running 20 trucks daily and has business on its books in excess of production.

—

AUTO BODY SCHEDULE

LANSING, MICH., June 2—The Auto Body Co. has just closed contracts for new business, which with other orders on hand, will fill the working schedule for more than 6 months. Orders are from the Olds Motor Works, the Reo Motor Car Co., Briscoe Motor Corp. and the Auburn Automobile Co.

Fewer Strikes in the Detroit Field

Nearly All Trouble Cleared Up and Men Back at Work—Ford Plants Threatened with Walkout

DETROIT, May 31—Automotive labor difficulties in Detroit are clearing away. The number of strikes is much reduced, the only ones being among tailors, butchers, box makers, etc.

The Liberty Starter Co.'s trouble is being rapidly eliminated. Of 700 men who originally walked out of this plant, 50 per cent are now back on the job.

The Timken-Detroit Axle Co. has several hundred men out. Several departments have been effectively closed. The company is operating, although its production has been greatly curtailed.

Malleable Iron at Standstill

The Michigan Malleable Iron Works and moulders are still in deadlock. Approximately 150 men are idle and the company is unable to get into production.

The Wadsworth Mfg. Co. is operating in spite of the strike which has been on there for 3 weeks. The output of Ford sedan bodies has been badly cut, but the new $6 minimum wage scale inaugurated by Wadsworth has proved an inducement which has brought hundreds of the striking employees back. This plant is still being picketed by the union, which claims that nearly 1000 men are still out.

The strike at the Aluminum Castings Co. has dwindled down to a minor affair. There are less than 200 men out, and dozens are returning daily.

The Commonwealth Brass Co. is closed tight because of a strike. Approximately 200 men are out.

The L. A. Young Industries Co. has about reached an agreement with its workers, 800 of whom quit their jobs 2 weeks ago. Nearly one-half of the strikers are back and others are returning daily.

Union Threatens Ford Plants

The United Automobile Vehicle and Aircraft Workers of America, which called the strike at the Wadsworth plant, are bending every effort to bring about a general walkout at the Ford Motor Co. and Fordson tractor plants. When the Wadsworth plant was closed by the strike Ford rushed hundreds of his men into that establishment to prevent the stopping of his supply of sedan bodies. These men were brought in under guard on army motor trucks. With the assistance of Ford, Wadsworth has been able to keep up a fair production, much to the chagrin of the outlaw union.

The Studebaker Corp. had a walkout at the No. 3 Detroit plant yesterday, several hundred men quitting. The trouble resulted from the expulsion of four foremen. The men now refuse to return to their jobs unless granted a substantial wage increase and shorter hours.

Novel Conditions for British Tractor Trials in September

Each Machine Will Be Rated by Dynamometer Before Listed for Entry at Society of Motor Manufacturers and Traders, Ltd.— Plowing Tests at Lincoln

LONDON, May 15—British tractor trials will be held at Lincoln, England, during September, 1919, by the Society of Motor Manufacturers and Traders, Ltd., which is the national automobile organization of Great Britain. It was expected that the Royal Agricultural Society of England would hold tractor demonstrations this year, but this society seemed to think that 18 months were necessary for the tractor manufacturers to recuperate from the war, and it will not hold tractor demonstrations until the fall of 1920.

The trials to be held next September are typically British in their searching character. They are not to be merely a demonstration, but will be a thorough test of the machine as well. For example, on the first day there will be plowing on heavy soil from 10 a.m. to 5 p.m., with an hour interval at lunch. On the second day there will be a similar program of plowing on light soil. On the third day there will be 2 hours plowing in the morning and 3 hours of cultivating land previously plowed in the afternoon.

Previous to the plowing, there will be a draw-bar dynamometer test for the purpose of guiding the entrants as to how many plows they can handle and also to ascertain the pulling capacity of the tractor. The tractors will be fitted with a recording dynamometer and readings taken at a speed of 2.5 m.p.h.

The total gear ratio on each gear, the driving wheel diameter in the case of wheeled vehicles, or the pitch diameter and pitch of the track sprockets in case of a track or creeper type machine must be declared and marked on the sign carried on the tractor.

During the plowing work an observer will accompany each machine and completely report on everything connected with its work.

At the end of each day the tractors will be parked, but no repairs, renewals, or adjustments will be made on them during the night, except by special arrangement with the judges. Any necessary adjustments must be made during the period of one hour immediately previous to the start of work in the morning.

Only 10 minutes will be allowed for warming up engines before the plowing starts. In case of steam tractors 30 minutes is allowed.

The judges of the trials will take into consideration the following factors in making their awards on the machines:

a—Weight of machine in full working order with spuds
b—Weight per sq. ft. on front and back wheels separately in the case of a wheeled machine, or with per sq. ft. of track in contact with the ground for a track machine, in each case calculated on a sinkage of 1 in. only
c—Cost of fuel and lubricating oils per acre, in proportion to the draw-bar pull
d—Water evaporated per acre
e—Ease of handling, including starting time and turning at headlands
f—Reliability (freedom from mechanical troubles)
g—Capital cost in relation to draw-bar pull in lbs.
h—Mechanical construction, having special regard to simplicity and access to wearing parts.
i—Safety of operation.
k—Number of attendants
l—Suitability for haulage and threshing purposes as shown by construction
m—Efficiency of adhesion
n—Working cost per acre
o—Capacity in acres per day of 8 hr.

Implements will be judged on the basis of:

a—Construction and operation
b—Adaptability for different widths and depths of plowing or cultivating
c—Quality of work done

It is the spirit of the rules that during the hour given each morning for refilling with fuel and making necessary repairs, that the operator or operators are the only ones who can work on the machine without penalty. If further assistance is required, the tractor on which such work is done will be penalized by recording the number of man-minutes for assistants so employed.

One grade each of gasoline, benzol and kerosene will be furnished. No cooling medium other than water is permitted.

Entries may be made by the British importer or the American manufacturer. Many entries have already been received and more than 50 different makes are expected.

Although the performance of implements is to be judged, entries of implements are not being taken. Plow and other implement manufacturers should get in touch with tractor makers if they wish their implements represented.

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COALITION MEETING

NEW YORK, June 3—The Material Handling Machinery Manufacturers Association will hold a coalition meeting of all manufacturers of mechanical handling machinery and equipment and accessories in the United States, at the Hotel Astor, June 11, morning, afternoon and evening. This includes all manufacturers of cranes, winches and hoists; elevators; gravity and power conveying machinery and apparatus; industrial trucks, tractors and trailers; bulk handling machinery; and all makers of equipment and accessories such as storage batteries, bearings, ropes for hoists, buckets, electric controllers and apparatus, etc. Advertising managers of companies manufacturing these products will hold a preliminary conference at the Hotel Astor, June 10, at 8 p. m., at which time it is planned to form an advertising council of the M. H. M. M.

Among the speakers for the day meeting are: James H. Collins, special writer of business articles, and Francis Holley, director of the Bureau of Commercial Economics. A general Forum discussion will be conducted in the afternoon and a mass meeting is planned for the evening, at which addresses will be made by Hon. Theodore Burton, former U. S. Senator, and Murray Hulbert, Commissioner of Docks, New York.

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GOODRICH INCREASES MILEAGE

NEW YORK, June 2—The B. F. Goodrich Rubber Co. has revised its adjustment schedules on both fabric and cord tires. Effective at once, fabric tires are to be guaranteed 6000 miles instead of 3500, and cord tires 8000 instead of 5000 miles. Goodrich tires already in the hands of purchasers, no matter when they were purchased, will be adjusted under the new mileage guarantee.

DECREASE IN AIR TRAINING

WASHINGTON, June 2—A decrease in the number of hours flown at training fields in this country is shown in a report by the Air Service. A total of 10,135 hours were flown in the week ended May 15, 1919, as compared with 23,943 for the week ended Nov. 11, 1918. The total attendance at training schools has decreased from 5099 on Nov. 11, 1918, to 294 on May 15, 1919.

The flying fatality rate has increased since the signing of the armistice. The rate now is one fatality to every 1467 hours flown as against one to every 3149 prior to the armistice.

The table shows the attendance at training schools and fatality rate.

Attendance	Elementary Schools	Advanced Schools.	Total
Nov. 11	2,423	2,676	5099
May 15	276	18	294
Graduations			
Nov. 11	208	96	304
May 15	155	..	155

Hours Flown at Flying Fields	Hours Flown
Week ended Nov. 11	23,493
Week ended May 15	10,135

Period	Fatalities	Hours Flown per Fatality
June 1 to Nov. 11	156	3,149
Nov. 11 to May 1	71	1,467

The serious accident rate (exclusive of fatalities) reflects a similar tendency.

Period	Serious Accidents	Hours Flown per Serious Accident
June 1 to Nov. 11	169	2,907
Nov. 11 to May 1	71	1,467

Citroen Stirs Up French Industry

Announcement of Low-Priced Car Perturbs Other Manufacturers —His Successful Advertising

PARIS, FRANCE, May 5—Automobile France is still perturbed over the activities of André Citroen, the automobile manufacturer, who, following the war, announced the turning over of his enormous munitions factory in Paris to the manufacture of a cheap car, of which he prepared to produce 100 per day.

The Citroen car, described some time ago in AUTOMOTIVE INDUSTRIES, is the nearest approach of any French manufacturer to a Ford, but the Citroen does not quite measure up to Ford capacity. It is a satisfactory light car for two passengers, but general sentiment is that it is not suitable as a 4-seated car.

There is no denying the fact that Citroen has had a very marked influence on the automobile industry in France. One example is that of advertising. Up to the time of the war, French car manufacturers did not understand the elements of advertising. The little money they expended was practically wasted, and some of the largest firms placed their advertising in the hands of men who were no better qualified than stenographers in advertising experience.

When Citroen came out with his large advertising program he got away from the narrow old French view of advertising. This advertising made a strong appeal and Citroen has been able to get in heavy deposits at the rate of 1000 francs or $250 per car. This is a particularly heavy deposit, when the reported profit that a dealer makes from the sale of a car is 650 francs or $130.

The French automobile industry, which must be looked upon as a very close body, resented Citroen's activities. The old firms were thoroughly stirred up by his activities. The reports that Citroen was not given space at the Lyons Fair can scarcely be credited, as his name appeared on the official list. He did not exhibit in one of the Fair spaces, however, but secured a corner store immediately opposite to the automobile section of the Fair. His exhibit was always well attended, as were practically all of the other car exhibits.

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TRUST CONTROL IN ENGLAND

LONDON, May 16—The Committee on Trusts, appointed by the British Minister of Reconstruction in February, 1918, has prepared its report on the action it considers necessary in view of the probable growth of trade organizations and combinations. The report has not yet been published, but the American Chamber of Commerce in London understands that the chief recommendation is that the Board of Trade should establish tribunals for investigating the operations of monopolies, combines and trusts, and then report to the government for action to remedy any abuse. All members of the committee are believed to have signed the report, but three members have submitted an addendum expressing the opinion that the recommendations are insufficient.

Their view is that capitalistic combination influences the price of practically every commodity sold to the public. They recommend, therefore, that the Board of Trade should establish a Trusts and Combinations Department to draw up a program to protect the community against the evils of monopolies and to secure economic benefits resulting from better industrial organization.

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British Import Rules Penalize the Consumer

LONDON, ENGLAND, May 13—The prospects are that the duty on automobiles imported into England after Sept. 1, 1919, will remain at 33⅓ per cent, and that restriction of imports such as exist to-day will be entirely removed. Nothing definite on this will be known until after Aug. 1. In the meantime the British situation is unsatisfactory to practically everyone. There are almost no deliveries of British cars and consequently the consumer is penalized, and the British dealers, no longer having their various forms of war work, are worse off financially to-day than they were during the war. The new preferential tariff will permit import of Canadian cars at 22 per cent after Sept. 1, 1919.

British manufacturers have been amazingly slow in getting into production, and many of the biggest firms have not yet delivered a single car to the public, and in some cases they have not delivered a demonstrating car to their dealers.

The rationing scheme for British importers whereby they obtain from April 1 to Sept. 1 50 per cent of the 1913 imports is not proving satisfactory. This scheme is generally considered unfair, because the government did not take the pre-war year, that is the 12 months ending July 31, 1914, but the earlier period, namely, the calendar year of 1913. There was no apparent reason for this action except that it enabled the government to handicap the importer a little more and restrict his activities.

The Olympia Motor Show in November is going to mark the real start of the British industry after the war. There will also be a Scottish national show at Glasgow in January, 1920. Add to this the tractor trials to be held in September, and the exhibition of commercial vehicles in the spring of 1920, and also the aero exposition in the spring of 1920, and you have enough indications that beginning with Nov. 1 the British should be fairly well under way.

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CHANDLER INCREASES DIVIDEND

CLEVELAND, June 3—The Chandler Motor Car Co. will increase its dividend from $12 to $16 per share per annum, and has declared a regular $4 quarterly dividend.

New Zealand Dealer on Foreign Situation

Clarkson Gives European Car Makers Two Years to Get Back to Normal—Demand Heavy

NEW YORK, June 2—J. B. Clarkson, one of the largest operators in motor cars, accessories, and motor apparatus in general, in New Zealand, arrived in America last week on his annual visit. Mr. Clarkson came from England, where he spent much time studying the industry. He is of the opinion that it will be at least two years before the European automobile organization is at its full 100 per cent effort.

The delay of European organizations getting into full production is, according to Mr. Clarkson, largely the result of the 4½ years of war. The reaction has made itself felt for many months and is still making its impression. The factory workers thought of nothing but the war from 1914 up to Armistice Day, just as the troops did, and there is a spirit of unrest that will not disappear for some time.

Mr. Clarkson is one of the directors and handles De Dion cars in practically all parts of the world outside of France and America. There are probabilities that the manufacture of De Dion cars will be taken up outside of France.

The car demand in New Zealand is found to be exceptionally heavy because the country has not been obtaining all the cars necessary during the war, and much money has been made from wool, meats, dairy products, etc.

The New Zealand business is entirely independent and not connected with Australia, as is so often imagined. New Zealand approximates 1000 miles, or a 5-day boat trip from Australia. Wellington, in the North Island, and Christchurch, in the South Island, are the major distributing centers, and Mr. Clarkson has large interests in both cities.

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TIRES FOR GREAT BRITAIN

WASHINGTON, May 31—Rubber tires can now be exported to Great Britain on a basis of 50 per cent of the 1913 importations. The shipments will be rationed by the British government.

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F. W. D. IN CANADA

CLINTONVILLE, WIS., June 2—J. D. Cotton will be president of the new corporation just formed to take care of the F. W. D. truck production in Canada as a branch of the Four Wheel Drive Auto Co. of this city. Henry Nyberg is vice-president and sales manager; Archie Kerr is secretary, and W. G. Cleghorn treasurer. The officers, with E. C. Kahel, W. T. Barrie and H. J. Sims, form the board of directors. Of the $200,000 capitalization, $100,000 of the stock is held by the Wisconsin company.

A site is to be selected and building operations commenced immediately on a structure 200 x 120 ft.

"Sufficient Fast Ships" Is Hurley's Promise to Pan-American Conference

Chairman of Shipping Board Says New York-Buenos Aires Time Will Be Cut from 24 to 15 Days—Other Speakers Tell of Use to Be Made of Capital

WASHINGTON, June 4—It is necessary for the stability of the trade in South and Central America to send not only salesmen but American intelligence and American capital into every Latin American country. Traveling salesmanship, as practiced in the past, will not suffice.

This will mean a complete revolution in the present and past methods of our doing business, but it will also mean a stable and permanent prosperous trade between the United States and its sister republics on the American continents. These principles are the keynotes of the discussions at the Pan-American conference which is being held here this week.

Every speaker from the Latin American countries dwelt upon the need of the investment of American capital and American intelligence in these countries, and Secretary of Commerce Redfield pointed out specifically, and in great detail, that American manufacturers must prepare for this permanent method of establishing trade if they went to maintain and develop the foothold gained in the last 4 years.

America has in 4 years become a creditor nation. Four years ago it was obliged to use the ships, insurance companies and banking facilities of its European competitors. It was a debtor nation. To-day it has ships, banking facilities, trade news sources, and has become the creditor nation of the world. It need no longer gain its trade news through competitors and allow them the opportunity of using the information thus acquired. Its financial turn from a nation with debts totaling $5,000,000,000 to a nation with credits of more than $12,000,000,000 has created a different situation which calls for different methods of foreign trade.

Brazil, which exported $119,000,000 worth of wool to the United States in 1918, has exported but $8,000,000 worth in the first 4 months of 1919; $22,000,000 worth of hides exported in 1918 has decreased to $4,000,000 in the first 4 months of 1919. This indicates that the trade between Latin America and the United States which, in 1918, was exports from the United States amounting to $685,941,239 and imports from South America to the United States totaling $1,105,274,492, will this year result in a reverse balance and means that Latin America will not have the cash to pay for her merchandise. This means further that if we increase the trade balance unfavorably to the Latin American countries by increasing shipments from this country, we must find some method by which Latin America can pay its bills. And, stated Secretary Redfield and all of the representatives of the Latin-American countries, the only way by which payment can be made will be through the investment of American capital in South America in the construction of highways, railroads, factories, petroleum industries and the purchase of Latin American securities.

By this means American commerce will secure three-fold results:

1—It will have a direct return to the United States of profits accruing from the investments.

2—It will have a flow of foreign trade to the United States as the result of the increased prosperity created in the Latin American countries by American capital.

3—It will have a development of wealth in Latin America which in turn will increase the buying power per capita in those countries.

Similarly the investment of American capital in Central and South America will mean to the Latin American countries the development of new lands, of new resources, the discovery of new riches, efficient economic organization and the employment of labor.

In making their investments, however, American manufacturers were urged by the Latin American speakers and Secretary Redfield to devote their capital honestly.

"There must come into our mutual trade," said the Secretary, "the spirit of service. Unless we serve you we shall fail; unless you serve us you will fail. The United States is now suffering from an overdose of prosperity. We have a huge reserve of gold behind our currency and in every element of economic power stand at the very height of prosperity.

"Because we are creditors on an enormous scale we must help those who owe to pay us what they owe and out of this problem comes the constructive type of foreign trade which offers the only solution to it. Our constructive service calls on us to let this capital flow out into the world for the world's enrichment. There will come inevitably to the United States rewards from such use of its wealth abroad. There will come, I hope, to the lands in which that wealth is used far greater rewards than can come to us."

Assurance that a fast and sufficient merchant marine will ply between the North and South American continents was given by Edward N. Hurley, Chairman of the United States Shipping Board. His statement, which is regarded as highly important because shipping transportation is considered of almost as equal importance as financial investment abroad, met with considerable applause.

Mr. Hurley stated that 226 ships of 863,000 deadweight tons have already been allocated to Latin American trade and the Shipping Board is now surveying the situation to establish regular American lines to ply between all the important ports of North and South America. The plans call for two lines from New York to serve the West Indies, a line from Valparaiso and other western ports to Mobile or New Orleans, a line of service between Valparaiso and Seattle, New York and Rio de Janeiro and other similar systems.

Ships will be used capable of 23½ knots per hr. which, stated Mr. Hurley, will reduce, for example, the time between Buenos Aires and New York from 24 days to 15 days. This will have an important effect upon first-class and parcel post mail and upon capital or business.

Development of the parcel post arrangements was urged by Otto Praeger, Second Assistant Postmaster General.

Individual representatives of the various Latin American countries told of the desire of continued and increased commerce with the United States. Statistics were quoted to show the increase in business in the past few years, one of the most astonishing reports being that on Cuba, which, with a population of slightly more than 2,000,000, had a foreign trade of $680,000,000.

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3-LITER LIMIT FOR FUTURE RACES

(*Continued from page* 1207)

plies to the Detroit Special, which had leaky water connections.

It is quite apparent that Ralph De Palma and Louis Chevrolet would have been further up in front toward the end and would probably have given each other and the winners a breathless contest for first honors if they had dodged their troubles. In fact, both of these drivers made major repairs on their cars during the race and yet finished well up in the money. Louis Chevrolet had to stop seven times. These cars did not possess sufficiently strong axles to withstand the great acceleration made possible by the powerful engines. A broken steering knuckle on one of the cars, a broken right rear hub on another, and a left rear wheel coming off, and a third, because of failure of the aluminum shell construction in the rear axle, tell the story of the Frontenac in the race. It was only by exceptional driving that the Chevrolets were able to finish with two of their Frontenac cars.

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NO TAX REPEALS NOW

WASHINGTON, June 3—The possibilities of a repeal of the taxes on motor trucks, which have been considered likely by the industry, do not appear favorable at present. Congress apparently is opposed to the repeal of any taxes and is even objecting to the repeal of the soda water tax, which it is said by many to be very unjust.

BROWNE OAKLAND MANAGER

NEW YORK, May 31—Charles M. Browne, president of the Automobile Dealers' Association, Inc., of New York City, and for the past 10 or 11 years manager of the New York branch of the Winton Co., has severed his connection with Winton. On June 1 he becomes manager in New York for the Oakland Motor Car Co., which will convert its dealership into a factory branch. Mr. Browne first became connected with the Winton company in 1905 in that company's Chicago branch. After half a year there he was sent to San Francisco to open a branch on the Pacific Coast and a year later came to New York.

He is succeeded by H. J. C. Miller, who has been his assistant.

Coincident with the change, the Oakland business, which has been handled by the Sidney A. Bowman Co. since 1913, will be removed to the C. T. Silver building. The contract between the Oakland company and the Bowman company does not expire until July 1. The Bowman company has not yet made public its plans for the future.

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Birger Jacobsson, manager of the Scandinavian division of J. B. Crockett Co. and the Clyde Cars Co., is in the United States for a short stay and will return to his territory soon.

A. H. Savage has been appointed sales representative of the Roller-Smith Co., New York, for Minnesota, North Dakota and part of Wisconsin and South Dakota, with headquarters in the Pioneer Building, St. Paul. Prior to 1914, Mr. Savage represented the Ft. Wayne Electric Works, and since 1914 has been representative in St. Paul of the Wagner Electric Manufacturing Co., St. Louis.

F. W. Marshner has been appointed manager of the Detroit branch of the New Departure Manufacturing Co., Bristol, Conn., succeeding the late Samuel B. Dusinberre. He has been in the Detroit office of the company for nearly seven years.

John R. Marchant, son of George F. Marchant, president of the Geo. F. Marchant Co., Chicago, and himself a member of the firm, was killed in action in France on Oct. 11, 1918, fighting as first lieutenant in the 131st Infantry of the A. E. F.

L. B. Fijux has been appointed Detroit district representative of the automobile equipment department of the Westinghouse Electric & Manufacturing Co., with an office in the Kresge Building. T. G. Haugh will assist him. Mr. Fijux was assistant manager of the Willard Storage Battery Co. for six years and manager of the Detroit office of the Bijur Motor Appliance Co. for five years. He succeeds W. A. Haines, who died last February.

Bernard M. Robinson has recently been appointed resident counsel and head of the legal department of the Firestone Tire & Rubber Co., Akron, taking over the duties of Mr. Hamill, who has been appointed secretary to President Harvey S. Firestone.

Men of the Industry

Changes in Personnel and Position

ARMLEDER ADDS SALESMEN

CINCINNATI, June 2—W. D. Thompson, formerly wholesale manager of the Lexington Colorado Auto Co., has joined the sales force of the O. Armleder Co. as western representative with headquarters in Denver. Jack Parker, with the Oldsmobile organization for the past five years, is also connected with the Armleder concern, and Charles F. Ward, Providence, R. I., is covering Massachusetts and Connecticut for the company. C. B. Harvey will have charge of the Middle West with headquarters at Chicago.

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FRIEDE JOINS HAYNES

KOKOMO, IND., June 4—Julian S. Friede, recently released from the British Royal Flying Corps, has joined the engineering staff of the Haynes Automobile Co. Previous to his aviation service he was on the engineering staff of the Paige Detroit Motor Co.

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Frank R. Boyd has resigned as assistant treasurer of the Oakland Motor Car Co., Pontiac, and will devote his time to personal affairs.

M. V. Smith has been made general superintendent of the Supreme Motors Corp., Warren, O. He was production manager of the Essex engine at the Hudson Motor Car Co. plant, Detroit.

W. S. Stevenson, general sales manager of the Bethlehem Motors Corp., Allentown, Pa., since its organization, has resigned on account of ill health.

Roy S. Davey succeeds W. S. Stevenson, who recently resigned as general sales manager of the Bethlehem Motors Corp., Allentown, Pa. Mr. Davey was formerly on the sales staff of the Chandler Automobile Co. and of the Packard Co. He has been with the Bethlehem Motors since its organization. Mr. Clay will succeed Mr. Davey as assistant general sales manager in charge of sales promotion.

Charles A. Greene, Chicago representative of the Borden Co., Warren, O., has opened an office for the company in Room 501, 549 West Washington Boulevard.

Edward A. Hefferman, recently returned from naval aviation service, will have charge of the office of the Ahlberg Bearing Co., recently opened in the City Bank Building, Kansas City, Mo.

C. E. MacTavish, who has been manager of the Chevrolet Motor Co. branch at Regina, Sask., has been transferred to the head office at Oshawa, Ont.

E. T. Causer has recently resigned as works manager of the R. D. Nuttall Co., Pittsburgh.

STANDARD PARTS VICE-PRESIDENTS

CLEVELAND, June 2—Dan C. Swander and John G. Utz have been elected vice-presidents of the Standard Parts Co. Mr. Swander will continue as supervisor of sales and Mr. Utz as supervisor of engineering. Both men have been with the company since its organization. Mr. Utz was formerly director of engineering of the Perfection Spring Co. Mr. Swander previously was eastern sales manager of the Firestone Tire & Rubber Co.

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C. H. Bassett, Detroit, has been appointed a southern district sales representative by the Fulton Motor Truck Co., Farmingdale, L. I. He was formerly with the Studebaker Corp. and the Elgin Motor Car Corp. and was a dealer and distributer at Jacksonville, Fla.

George W. Brooks has been appointed representative of the Hudson Motor Specialties Co. for Texas, New Mexico, Oklahoma, Kansas and Arkansas.

Major Howard Blood, connected with the airplane experimental station at Dayton during the war, has been appointed general manager of the plants of the General Motors Co. at Walkerville, Ont. Two plants are now being built for manufacture of engines and axles.

Stephen A. Douglas, Detroit Section S. A. E., has been appointed chairman of the committee on activities at the annual mid-summer meeting at Ottawa Beach in June.

M. B. Hoagland has been appointed director of sales of the Signal Motor Truck Co., Detroit. He was with the American Steel & Wire Co. for 17 years.

J. Gordon has been appointed middle western sales representative of L. V. Flecher & Co., New York City.

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UNIVERSAL TOOL SALESMEN

DETROIT, June 3 — The Universal Tool Co. has appointed A. E. Hrobskey to cover New York and the New England states, with an office in New York. C. E. Hinckley will cover Pennsylvania, New Jersey, Maryland and Delaware, with headquarters at the York, Pa., factory. J. E. Nebrick will cover Ohio, Michigan and Indiana, with headquarters at the Detroit office. Merritt Campbell will cover Illinois, Missouri and Iowa, working from the Indianapolis office. Beginning June 1, the main office of the company will be in the McKerchey Building, Detroit. In the last few months the company has opened factories in Detroit and Windsor, Ont., in addition to the plant in York, Pa.

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EMPIRE AXLE REORGANIZED

DUNKIRK, June 2—The Empire Axle Co. has been reorganized with a capital of $400,000, as a subsidiary of the Watson Corp., Canastota, N. Y., with the following officers: President and assistant treasurer, O. F. Hakes; vice-president, chief engineer and assistant secretary, E. de H. Caldwell; sales and advertising manager, R. W. Foley. It plans to increase the capacity of its plant.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

RECEIVER FOR MAXIM

NEW YORK, June 2—The Maxim Munitions Corp., which was formed in 1915 with $10,000,000 capital, to take over the inventions of Hudson Maxim, and which in June, 1918, announced its intention of making and marketing a farm tractor, as well as acting as domestic and export distributer for the trucks manufactured by the Dart Motor Truck Co., Waterloo, Iowa, has been placed in the hands of a receiver. The courts have appointed H. H. Henry, who for the past two months has been president of the company and prior to that was vice-president and general manager.

It is understood that the assets and liabilities of the company are about $1,000,000 each, and it is stated that there appears an excellent possibility of the company being reorganized and continued. Until the creditors and stockholders meet, however, nothing definite can be stated with regard to future plans. A meeting is scheduled for the near future and in the meantime the business will be temporarily discontinued.

NEW CHEVROLET SALES ZONES

FLINT, MICH., May 31—The Chevrolet Motor Co. has just created seven new sales zones in the United States and one in Canada. This gives the company a total of 15 sales zones in the United States and two in the Dominion. One of the new zones will have its headquarters in Chicago and another in Cincinnati, where the Chevrolet company is already operating retail sales branches. The wholesale departments in these two cities will start business Aug. 1. The Cincinnati department will be in charge of John Flynn, who was with the Baltimore branch for 4 years. H. H. Monday, for several years connected with the Washington branch, has been transferred to Chicago to handle the wholesale business there.

While the Chevrolet company has been operating on a fixed schedule of 700 cars a day, this production is constantly being exceeded, the average production for last week being 726 cars.

KENTUCKY WAGON BUILDING

LOUISVILLE, KY., June 2—The Kentucky Wagon Manufacturing Co. will begin on Aug. 1 the construction of a new 2-story steel and brick building costing approximately $100,000. According to present plans the structure will be occupied by the car, upholstering, paint and assembly departments, which are part of the car and truck branches. The plant of the Kentucky Wagon company at the present time consists of 32 acres.

LANSING BODY DOUBLES SPACE

LANSING, June 3—The Lansing Body Co. has started the erection of a new building which will double the present floor space. The new structure will house the painting and finishing department.

NEW COLUMBIA FACTORY

DETROIT, June 3—The Columbia Motors Co., which has been contemplating an addition to its plant for some time, has purchased from the Detroit Seamless Tubes Co. 6 acres of ground, on which a new factory will be erected. The proposed plant will be completed by Jan. 1, 1920. It will have a floor space of 150,000 sq. ft. Part of the site is occupied by the Fisher Body Corp.

OLD TRUCK PLANT SOLD

WYANDOTTE, MICH., May 28—The old plant of the Detroit-Wyandotte Motor Truck Co. has been sold to John J. Marx of Detroit. It has a floor space of 40,000 sq. ft., and is located on a 2½-acre site. The plans of the purchaser have not been announced.

REPUBLIC SPECIAL BODIES

ALMA, MICH., June 2—The Republic Motor Truck Co., Inc., is furnishing dealers with a complete line of special bodies made to their specifications. These bodies are built entirely by the Republic body department and can be mounted on trucks at the factory or shipped separately.

PARKER GETS MORE CAPITAL

MILWAUKEE, June 2—Capitalization of the Parker Motor Truck Co. was increased from $350,000 to $500,000 in the form of preferred stock at the annual meeting of the company. Adam J. Mayer was re-elected president and other officers are: Vice-president, F. H. Parker; secretary-treasurer and general manager, L. L. Newton. Directors were re-elected.

TOOL SALVAGE DROPS PENINSULAR

DETROIT, June 2—The Peninsular Tool Salvage Co. has changed its name to the Tool Salvage Co. This action is taken because of the difficulty customers found in spelling and pronouncing the word "peninsular."

ATTWOOD BRASS MOVES

GRAND RAPIDS, MICH., June 2—The Attwood Brass Co. is moving from its present plant into much larger quarters, having purchased a 2-story factory building formerly occupied by the Steel Furniture Co.

LAKESIDE FORGE ADDS

ERIE, PA., June 2—The Lakeside Forge Co. is adding a building 104 x 81 ft., of brick and steel, for increasing its office and shipping space.

MERGER PROGRESSES

NEW YORK, June 2—Negotiations pointing to an early merger of the International Motor Co. and the Wright-Martin Aircraft Corporation are indicated by operations which have been in progress for some time. It is expected that next week the stockholders of the Wright-Martin organization will approve a plan whereby the New Brunswick factory of Wright-Martin is sold to the International Motor Co. in exchange for stock in the latter organization. The factory will be used at increased capacity for the manufacture of trucks and should permit of the International doubling its truck output. The New Brunswick factory has 500,000 sq. ft. area and has been used to manufacture Hispano-Suiza engines during the war.

The Wright-Martin Corp. will be reduced in capitalization and continue to exist as an aircraft corporation for the carrying on of necessary aircraft development and manufacturing work.

The International Motor Co. has not announced any definite plans as to whether the New Brunswick factory of the Wright-Martin will be used solely in the manufacture of truck engines or if Mack trucks will be manufactured in their entirety there.

TRACTORS FOR FRANCE

SANDUSKY, OHIO, June 2—The Dauch Manufacturing Co., makers of the Sandusky tractor, has received an order for the immediate shipment of 500 of their 10-20 model J tractors to France to be used in reconstruction work. Two hundred machines will be the standard 10-20 model J type, the balance being for a new frameless type model which the Dauch company has just perfected. Shipments are going forward at the rate of 25 a week.

HIGHWAY MOTORS TRUCKS

CHICAGO, June 2—The Highway Motors Co. has recently been incorporated to build American Knight-motored trucks in 3½- and 5-ton capacities. It has purchased the assets of the Motor Trucks, Ltd., Brantford, Ont.

OMOLITE CREDITORS TO MEET

JAMESTOWN, N. Y., May 29—A meeting of the creditors of the bankrupt Omolite Co., Inc., has been called for June 11, in the Federal Court Room of this city to pass on the reports and account of distribution of funds on hand when the case is closed.

The financial account, as it stands, is as follows:

Receipts from sale of assets		$10,000.00
Disbursements, administration expense	$743.76	
Preferred claims	1,447.05	
First dividend paid	4,158.74	
Total		6,349.55
Balance on hand		$3,650.45

PACKARD EXTRA DIVIDEND

Packard Motor Car Co., Detroit, 2½ per cent extra dividend in addition to regular 8 per cent dividend.

Automobile Trade With Allies Discussed

Car Makers and U. S. Officials Talk Over Export Problems of the Immediate Future

WASHINGTON, June 2—The Allied governments and peoples are disposed to regard the United States unfavorably because of the stand of the American Peace Commission against large indemnities from Germany, and as a result it is difficult for the State Department to approach the Allies on any commercial questions, without danger of creating a wider diplomatic breach, was the statement of foreign trade advisers of the State Department to-day to members of the export committee of the National Automobile Chamber of Commerce.

This statement was made in reply to the expressed belief of the export committee that its members thought that immediate resumption of normal business conditions would work best for both the Allies and the American manufacturers. "All the cars sold in the allied countries of American manufacture," they stated, "will help those nations to recover, and will not interfere with their own automobile manufacture."

England, it was pointed out, is paying 100 per cent above the list price of new cars for used cars.

The meeting was attended by W. Frost, C. H. Albrecht and A. C. Millspugh of the Department of State, J. Walter Drake of the Hupp Motor Co., J. Rathbun of the White Co., P. S. Steenstrup, General Motors Corp., C. G. Young, Willys-Overland Co., Louis Domeratzcy, Department of Commerce, Alfred Reeves, Pyke Johnson and H. R. Cobleigh of the National Automobile Chamber of Commerce.

The disadvantages of the American tariffs, which include a 45 per cent duty on automobiles imported into this country valued at $2,000, and 30 per cent on those under $2,000, was pointed out by J. Walter Drake. The foreign countries sell the United States only high priced cars and as they have to pay a 45 per cent duty on these, they are inclined to regard our entire tariff duty as 45 per cent, and consequently in enacting their tariff laws base them on an American 45 per cent duty. Recommendations for the repeal of this duty with a straight 30 per cent tariff in its place were made. The government department officials replied that this matter could be handled only through Congress when it revises the tariff.

C. H. Albrecht said that the American Ambassador in France is trying to get the French government to remove its embargoes and restrictions on American cars and parts. Nothing can be done through diplomatic channels toward effecting reduction in the French tariffs, it was stated, until after the American tariff is revised.

The fact that France is not in favor of the sale of the American army cars and trucks to individuals in France met with serious objection from the automobile export managers. Peter Steenstrup stated that there are about 1900 Cadillac passenger cars in France with the American army, and if these are bought by the French government and later sold to individuals, according to present plans, the General Motors Corp. fears that there will be no attempt to furnish parts or service, and the reputation of the company may suffer in consequence. He stated that if France will remove its embargo and allow parts to be shipped into the country, the General Motors Corp. will undertake to provide parts and service for Cadillac owners.

It was also suggested that this government should take steps to have France change its plan to allow cars to be sold by the American army. The government officials stated that this was a War Department matter and must be taken up by the N. A. C. C. through the War Department.

The delays in the mails and cables and the British censorship were stated by Drake to be serious obstacles to American foreign trade at present. The State Department announced that all censorships to neutral countries by Great Britain had been abolished and that a protest has been made by this government against all other mail censorship by England, in which it was asserted that the information obtained from this censorship is being used for the benefit of British manufacturers. Great Britain has replied denying this and the American government is seeking specific instances. It was further stated that there is no censorship on cablegrams to the Far East and that any delay is due to congestion.

An interpretation of the British restrictions on American automobile exports to 50 per cent of the 1913 exports was given by Louis Domeratzcy. He said that instead of this percentage applying to the exports of that year, it applied to the imports. Importers who were in business in 1913 can import from the United States 50 per cent of the imports for that year, regardless of the makes and types. This interpretation removed the fears that manufacturers who had started in business in 1913 would not be able to ship cars under the British ruling.

A statement that Germany will likely resume normal trade conditions before any of the Allies can get back into peace time production was refuted by government officials, who stated that the peace commission found conditions in Germany so bad that it had to cut down the indemnity and that, because of this, the Allied experts are certain that German commerce cannot be resumed in the near future.

The government officials were asked to make arrangements with the British government so that automobile manufacturers with branches in Canada will know what percentage of cost must enter into an automobile manufactured in Canada to overcome the British restrictions. They asked the government officials to make such arrangements, if possible, whereby a car assembled in Canada, with 50 per cent of the cost in assembling, and 50 per cent in the parts exported from the United States, will be recognized by Great Britain as a Canadian product.

Requests were also made by the N. A. C. C. for more government investigators of foreign car markets. The answer was that the appropriations to the departments are insufficient to allow the sending of more men to foreign countries at present.

If the manufacturers will send their own investigators abroad, it was stated, the Department of State will arrange that these men can have full co-operation of the consuls.

Although there was no definite result from the meeting, it was felt that the problems had been properly placed before the government officials and the way opened for definite results at future meetings.

Tax Hearing Promised to Car Builders

Chairman Fordney Tells N. A. C. C. Committee He Is in Sympathy with Plea

WASHINGTON, June 2 — Alfred Reeves, manager of the National Automobile Chamber of Commerce, and a party of automobile manufacturers called on the House of Representatives Ways and Means Committee to-day and were assured by Chairman Fordney that they would be granted a hearing on the subject of manufacturers' tax as soon as it was possible to arrange it.

Mr. Fordney assured the automobile men that he was in entire sympathy with their plea for the removal of the manufacturers' tax. First, however, it would be necessary to remove the so-called luxury tax, that on clothing and similar articles. As soon as that is disposed of, the committee will be willing to take up the manufacturers' tax. One important condition in considering the removal of this tax is the need of the government for money. The manufacturers, he said, would do well to remember that government expenses are still running high.

Mr. Reeves said that it had been intended to take up this matter with the Ways and Means Committee to-morrow, but their success in meeting Chairman Fordney made it unnecessary to stay over. As soon as the date is set for the hearing, notice will be given to the National Automobile Dealers' Association, the Automobile Jobbers' Association, the Motor Accessories and Manufacturers' Association, the Rubber Association and other organizations which have been helpful in presenting this matter to government officials. The plan now is to urge the repeal first of the parts taxes, second, of the tax on motor trucks, and third, on the passenger cars.

2750 Mile Flight Planned by Army

Martin Bombing Airplane Will Fly Across Continent from Mineola to San Francisco

WASHINGTON, June 3—The War Department announces that the Army Air Service has planned a one-stop transcontinental flight of 2750 miles, by a Martin bombing airplane to be undertaken within a few days. Capt. Roy N. Francis and 1st Lieut. E. A. Cline will pilot the machine. Two or three mechanics will be carried.

The start will be made from Mineola, N. Y., field. The stop will be at North Platte, Neb. San Francisco is the destination. The tentative schedule calls for an average speed of 100 m.p.h. The distance from Mineola to North Platte is 1502 miles, the next leg being 1248 miles. The plane will start from Mineola at 3.30 a. m. on a day to be set. It will stop at North Platte from 8.09 p. m. that evening until 3.30 a. m. the following morning, and is scheduled to arrive at San Francisco at 5.58 p. m.

The Air Service authorized the following description of the machine in which the transcontinental flight will be attempted:

Martin Military Bomber Selected

"The United States Martin bomber is the airplane selected by Capt. Roy N. Francis to attempt the one-stop transcontinental flight because of especial suitability. The airplane was originally designed for military purposes as a day or night bombing plane or for long distance photography.

"The power is supplied by two Liberty motors of 400 horsepower each, mounted in the wing gap on each side of the body. The body is well designed and commodious. At the nose is the cockpit for the front gunner. He has access to a passage through which he can go aft to handle the rear lower gun, or sit beside the pilot on a folding seat. The pilot is placed on the right hand side of the body and well up, so that his range of vision is the best possible. He is provided with a wheel type control and has a splendid view of the instrument board. Behind the pilot are the three main gasoline tanks. To the rear is a mounting for the lower gun, which commands a large field of fire to the rear, below and to both sides.

"The wing structure is very light. The designer was particular to observe the principles of stream line, rigidity and strength. The total wing and control area is 1355 square feet. The span of the upper and lower wings is 71 feet 5 inches and the depth of each wing is 7 feet 10 inches. The gap between the wings is 8 feet 6 inches. The length over all is 46 feet and the height over all 14 feet 7 inches.

"The under carriage is composed of four 800 by 150 mm. wheels. The axles are hung on the usual rubber cord suspension, but have a great amount of freedom not only vertically but in the other two directions. All of the lateral forces are taken up by the centre trussing under the body. The two outside struts are free to swing laterally, and hence only absorb the vertical component of the landing shock. A single wheel and foot bar control is provided for the pilot's cockpit.

"There are four equal ailerons for the maintenance of lateral stability. The tail services are of steel and wood construction. The elevator is one piece and with its generous area and ease of operation forms a positive control to be relied upon in any emergency. Two balanced rudders working in synchronism permit the pilot to control his direction under any conditions with ease. In fact, when flying with one engine dead, the amount of rudder necessary to correct the offsetting force of the other engine is surprisingly small.

"Three sturdy gasoline tanks, mounted securely inside of the body, contain the main supply of gasoline. This airplane is particularly adaptable to the requirements of civil aeronautics—for passenger, mail and express service, coast, border and forest patrol. This adaptation would not involve any important changes, for the same machine less the military equipment is immediately serviceable for the carrying of one ton of mail or of twelve passengers at a speed of from 100 to 105 miles per hour. Requirements of safety, so important in our transport, are especially well fulfilled by this machine because it can fly and climb on one engine."

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NC-4 Averages 78.7 M.P.H. From Rockaway to Plymouth

NEW YORK, June 3—Secretary of the Navy Daniels has ruled that the NC-4, which concluded its flight to Plymouth, England, May 31, shall be brought home by ship. This decision was based on the argument that the NC-4, the first airplane to cross the Atlantic, should not again be risked in long flight but should be sent home and properly preserved as an historical relic. Some naval men thought the NC-4 should try a non-stop flight home, or a flight with only one fuel stop in mid-ocean. It was decided, however, that seasonable winds made a successful westward non-stop flight highly improbable. Lieut.-Commander Read and the NC-4 crew have been much feted in England and visited Paris at the request of President Wilson. The NC-4 record, as unofficially compiled at Washington, is:

Course	Date, May	Distance, Miles	Time, Hrs.	Speed, M.P.H.
Rockaway-Chatham (forced landing about 100 miles off Chatham)	8	345.45	5.45	59.87
Chatham-Halifax	14	368.42	3.51	97.87
Halifax-Trepassey	15	529.69	6.20	83.60
Trepassey-Horta	16-17	1,381.81	15.18	90.27
Horta-Ponta Delgada	20	172.72	1.45	99.83
Ponta Delgada-Lisbon	27	921.21	9.44	94.50
Lisbon-Mondego River	30	115.10	2.07	56.20
Mondego River-Ferrol	30	253.30	4.37	52.50
Ferrol-Plymouth	31	523.30	6.59	74.60
Complete Flight—				
Rockaway to Plymouth	8-31	4,519.70	57.16	78.70
Transatlantic Flight—				
Trepassey to Lisbon	16-27	2,150.00	26.47	80.30

FRENCH PLANES TO U. S.

WASHINGTON, June 2—Following the settlements of contracts with France for airplanes, it is estimated that 600 Spad-4 airplanes, 1000 Nieuport-28 airplanes, 1000 Hispano-Suiza 220 hp. engines and 800 Gnome Monosoupape engines will be available for shipment to the United States. There is still on order with France a contract for Hispano-Suiza 300 hp. engines, 406 of which have been delivered, leaving 94 still on order.

Twenty-one per cent of the total number of De Haviland-4 airplanes produced before the armistice reached the zone of advance before hostilities ceased. Following is a table showing the production and distribution overseas of the De Haviland airplanes:

		Per cent of total produced
Produced	3227	100
Floated	1885	58
Received, A. E. F.	1440	45
Dispatched to Zone of Advance	667	21
Dispatched to training fields, A. E. F.	293	9

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CAPITAL INCREASES

NEW YORK, June 3—The B. F. Goodrich Co., Akron, proposes an increase in capital from $84,000,000 to $109,000,000. The $25,000,000 new stock will be preferred, and $15,000,000 will be sold immediately to holders of common and preferred stock. The sale of this additional stock is to provide funds to take up $15,000,000 2-yr. notes maturing next November.

The Fisk Rubber Co., Boston, will offer to stockholders $15,000,000 new first preferred stock and $2,500,000 new second preferred stock. Present first preferred stockholders of record June 10 and present second preferred and common stockholders of record July 15 will have the right to subscribe. Funds from this sale will be used to retire the $4,025,000 outstanding first preferred and $5,000,000 convertible first preferred stock and will leave an increase in the capital of the company of $8,475,000.

March Petroleum Stock Satisfactory

PRODUCTION

	March 1919	February 1919
Crude oil (bbl.)	27,886,775	25,232,876
Gasoline (gal.)	311,306,755	285,518,194

STOCKS ON HAND

	March 31, 1919	Feb. 28, 1919
Crude oil (bbl.)	15,106,361	14,820,601
Oils purchased to be re-run (bbl.)	1,121,963	1,176,483
Gasoline (gal.)	546,062,429	458,449,187
Kerosene (gal.)	294,677,623	303,062,436
Gas and fuel oil (gal.)	749,067,806	692,816,000
Lubricating oil (gal.)	165,495,254	152,297,163
Wax (lb.)	235,588,922	209,908,707
Coke (ton)	37,642	33,716
Asphaltum (ton)	113,949	102,547
Miscellaneous (gal.)	468,035,524	500,413,825

WASHINGTON, June 4—Although production of crude oil and gasoline for March shows an increase over the February figures, the fact is discounted by the circumstance that March has 31 days against February's 28. Nevertheless the position continues satisfactory.

Stocks on hand indicate a healthy condition, particularly in regard to gasoline, which is substantially in front of February and is nearly 20,000,000 gal. better than March, 1918. Gasoline and fuel oil and also lubricating oil show an appreciable gain when compared with February totals and an even greater advance over the figures of a year ago.

The comparative analysis of production and consumption of gasoline, kerosene, gas and fuel oil and lubricating oil for the first three months of 1919 and 1918, as shown in table herewith, indicate a satisfactory position. With the exception of the kerosene item matters are now distinctly better than was the case in 1918.

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AIR MAIL CARRIES 408,560 LETTERS

WASHINGTON, June 3—The Chicago-Cleveland Air Mail Service, during its first half month, has made a daily 100 per cent performance, except two half trips May 21 when the field at Bryan, Ohio, was so flooded that the planes could not rise from the ground.

Out of a possible mileage of 11,050, a total of 10,725 was accomplished, making a performance of 97.1 per cent and 408,560 letters carried. Since May 21 the daily trips in each direction are about 325 miles, non-stop. Twenty such non-stop trips were made without engine trouble of any kind, and with a single mishap in the nature of a fire in the pilot's cockpit of a plane operated by Pilot Frank McCusker, resulting in the death of that pilot. This has been the only fatality to any pilot carrying the mail since the service was established May 15, 1918.

The long distance non-stop flights on the Chicago-Cleveland route are being performed by the De Haviland planes strengthened for cross country mail carrying and equipped with low compression Liberty engines. The best time made on any trip between Chicago and Cleveland was 2 hr. 42 min. for 325 miles, and the longest trip was 4 hours, due to a bad head wind. The average speed for the half month was 98½ m.p.h. and the average gas consumption was 23 1/5 gal. per hour. The mail leaves Cleveland and Chicago at 9.30 o'clock each morning, including Sundays, and arrives at its destination usually between 12 and 1 o'clock in the afternoon.

Airplane Provides for Mail Clerk

WASHINGTON, June 3—Recent requests for bids for airplanes by the Air Mail Service resulted in eight bids, of which the lowest are from the Lawson Air Line Co., Milwaukee, which has designed a plane embodying mail car equipment, and allows for the employment of a mail clerk en route. The engines will be installed by the government and it is expected that the Liberty engine will be used.

The airplane is of the biplane type, with the chassis built between the two wings, with engine space provided at each side. There is sufficient space so that the men can walk around the body, which is enclosed in glass. A rack has been designed in which the mail may be distributed during the flight, and a drop chute allows for the discharge of mail bags at principal cities without stops. A model of the plane has been ordered and will be demonstrated here when completed.

Comparative Analysis of Production and Consumption of Petroleum Products (Gallons)

First Quarters of 1919 *and* 1918

	Gasoline		Kerosene		Gas and Fuel		Lubricating	
Income	1919	1918	1919	1918	1919	1918	1919	1918
Stocks Dec. 31, 1918 & 1917	297,326,983	412,256,833	380,117,829	497,750,082	659,001,357	577,899,112	138,853,574	136,855,348
Production, first quarter	898,535,505	746,584,631	492,973,977	391,804,511	1,718,257,965	1,646,017,449	197,871,680	184,232,690
Total	1,195,862,488	1,158,841,464	873,091,806	889,554,593	2,377,259,322	2,223,916,561	336,725,254	321,088,038
Outgo								
Exports	96,639,064	123,470,462	184,740,900	136,526,782	*232,970,028	351,051,012	72,081,945	62,106,421
Shipments to our insul. pos.	3,048,527	3,389,345	4,548,619	2,583,213	26,250,840	494,554	556,588	557,948
Domestic consumption	550,112,468	505,599,271	389,124,664	393,864,058	1,368,970,648	1,388,923,268	98,591,467	111,851,271
Stocks March 31, 1919 & 1918	546,062,429	526,382,386	294,677,623	356,580,540	749,067,806	483,447,727	165,495,254	146,572,398
Total	1,195,862,488	1,158,841,464	873,091,806	889,554,593	2,377,259,322	2,223,916,561	336,725,254	321,088,038

*Includes fuel or bunker oil for vessels engaged in foreign trade. 1919—2,017,955 bbl. 1918—1,357,044 bbl.

Output of Refineries of the United States by Months

1918	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbl.)
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,623,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,618	121,218,320	510,165,397	58,360,914	35,087,337	42,371	42,033	75,134,088	983,992
March	26,239,662	3,696,872	269,627,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,735	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	58,433	159,374,139	1,338,304
August	28,534,275	6,376,353	330,335,046	149,678,850	671,113,871	72,892,879	41,829,516	51,759	59,715	163,345,034	1,337,327
September	28,390,431	5,485,747	314,595,959	164,963,798	653,085,050	70,593,079	42,704,894	48,052	49,157	138,201,963	1,236,834
October	29,237,767	5,571,847	314,251,318	164,928,640	661,780,441	72,244,633	43,470,132	48,820	51,878	166,109,867	1,161,545
November	27,411,636	3,857,754	312,968,640	169,278,105	604,403,494	72,178,602	49,642,007	51,393	35,387	75,430,160	1,236,818
December	26,958,157	3,474,890	291,744,465	161,742,713	587,873,987	64,987,842	43,847,092	41,747	37,596	84,273,730	1,352,657
Total	326,024,630	50,565,204	3,570,312,963	1,825,360,137	7,321,397,557	841,465,767	505,144,357	559,663	607,968	1,286,710,383	14,556,625
1919											
January	26,967,332	3,919,492	303,710,556	158,501,260	589,630,056	68,304,613	44,987,603	59,003	54,074	92,324,236	1,183,767
February	25,232,876	3,997,025	283,518,194	164,181,787	553,853,753	62,503,072	42,702,886	57,200	41,348	88,515,735	1,115,040
March	27,866,775	3,351,821	311,306,755	170,290,930	574,774,156	67,063,995	43,255,128	58,642	50,139	107,880,754	1,176,746
Total	80,066,983	11,268,338	898,535,515	492,973,977	1,718,257,965	197,871,680	130,945,617	174,845	145,561	288,720,725	3,475,553

CLASS B RULES FOR TRACTOR TESTS

(*Continued from page* 1237)

width will be obtained by measuring the width plowed, from outside to outside edge of furrow, measured every 10 rods as indicated by mark stakes, and then deducting the width between the mark stakes which is not included in the test. The rate of travel during the dynamometer test should be the same as during the plowing period.

7B—Before the test commences the fuel tanks will be filled to the top with tractor set level. The run will be made on one fuel only to eliminate the necessity of including two fuels in the final result. If kerosene is to be used, the motor may be warmed up on gasoline and the fuels switched just before starting the test. The fuel will be supplied the entrant from a common source in the field.

8B—The water will be measured by the same method as used in measuring fuel. The water used in the cooling system will be kept separate from that used with the fuel and air washer.

9B—The rate of travel will be adjusted in the preliminary rounds so as to come within 10 per cent of the rated speed.

The same rate of travel should be maintained throughout the test and the observer will keep an accurate check on this by timing every second round, excluding the time required in turning at all stops and at the ends. However, the time consumed for turning at ends will be included in the plowing time.

10B—The plow will be adjusted in the two preliminary rounds and no change of adjustment will be permitted during the test and including the first preceding and following rounds when the dynamometer tests are made.

11B—The depth will be checked every 10 rods in order to obtain accurate average of the depth plowed. These distances will be indicated by mark stakes.

The plow will be set for the upper depth before the test is started and that depth maintained throughout the test.

12B—The width cut by the inside plow will be checked by the observer at least every second time depth is taken and the operator will be required to maintain even cut.

13B—If in the aggregate it is found necessary to stop the tractor more than thirty minutes, the test is annulled.

14B—This rule, at the discretion of the committee, provides an opportunity to re-enter an outfit that has been disqualified.

15B—Much of the data will be available and turned over to the company representative promptly at the completion of each test, but the committee reserves the privilege of checking it and will submit the complete results in standard forms before 10 p. m., for all tests conducted during the day.

All data will be made public unless a manufacturer, for any reason, desires to withdraw the results of some machine and then no part of such data may be issued later.

Automobile, Truck and Parts Exports from New York for April

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina	57	$61,135	..	.....	$190,823
Australia	85	92,951	11	$18,810	79,802
Barbadoes	2	1,500	..	.....	1,096
Belgium	28	40,875	20	85,122	5,194
Bolivia	..	.....	..	.....	1,179
Brazil	216	163,095	6	3,765	32,098
British East Africa	13	10,576	..	.....	1,652
British East Indies	..	.....	..	.....	936
British Guiana	5	6,995	6	5,457	3,566
British Honduras	..	.....	..	.....	260
British India	138	166,134	12	27,886	35,965
British Oceana	..	.....	..	.....	138
British South Africa	1	500	1	844	5,175
British West Africa	19	17,787	3	3,688	3,155
British West Indies	..	.....	2	1,100	3,856
Chile	81	157,725	16	26,960	118,472
Colombia	11	8,857	4	4,815	3,578
Costa Rica	1	1,436	..	.....	739
Cuba	33	25,680	21	56,937	92,163
Danish West Indies	2	2,425	..	.....	282
Denmark	114	167,014	46	79,976	12,924
Dutch East Indies	205	280,907	61	123,223	51,266
Dutch Guiana	5	2,712	..	.....	375
Dutch West Indies	3	1,450	1	600	197
Ecuador	7	8,922	..	.....	2,866
Egypt	39	19,812	..	.....	5,664
England	116	150,600	..	.....	313,341
France	4	18,900	134	483,093	290,061
French Africa	34	28,244	1	600	243
French East Indies	1	2,300	..	.....	328
French Guiana	..	.....	1	550	.....
French West Indies	11	7,023	..	.....	7,855
Gibraltar	12	17,718	..	.....	40
Greece	5	7,890	..	.....	1,324
Guatemala	1	2,559	..	.....	755
Haiti	22	25,840	..	.....	3,230
Honduras	..	.....	..	.....	295
Hongkong	..	.....	..	.....	20
Ireland	..	.....	..	.....	212
Jamaica	14	10,405	3	1,521	4,763
Japan	..	.....	..	.....	13,784
Mexico	11	14,570	1	5,250	7,019
Netherlands	42	54,064	8	18,000	120,613
Newfoundland	6	9,952	2	2,711	986
New Zealand	298	330,223	8	14,516	47,710
Nicaragua	1	1,644	..	.....	3,488
Norway	88	152,031	36	95,213	16,437
Panama	15	9,184	20	11,326	.....
Peru	87	105,729	34	23,990	16,917
Portugal	7	4,300	..	.....	25,205
Russia in Asia	..	.....	..	.....	49,113
Portuguese Africa	..	.....	..	.....	66
Russia in Europe	..	.....	..	.....	510
Salvador	9	13,703	..	.....	1,550
Santo Domingo	14	8,105	1	3,000	12,252
Serbia	..	.....	1	1,200	.....
Spain	114	90 450	2	4,500	20,188
Sweden	57	68,005	1	1,800	1,000
Straits Settlements	..	.....	..	.....	7,340
Trinidad	24	13,383	8	5,160	11,868
Uruguay	293	298,664	18	24,731	72,259
Venezuela	50	40,670	9	4,989	13,765
Totals	2,401	$2,722,944	499	$1,145,733	$1,727,556

MINERAL OIL EXPORTS FOR APRIL

WASHINGTON, May 29—Fewer gallons of mineral oil were exported last month as compared with a year ago, but the value shows a marked increase. The figures are: April, 1919, 208,515,323 gal. valued at $27,893,100; April, 1918, 227,998,969 gal. valued at $25,689,393. Gasoline exports total 27,546,646 gal. valued at $6,981,164 for April, 1919, as compared with 46,857,293 gal. valued at $11,280,216 for April, 1918. Following are the detailed exports:

Oil Exports for April and Ten Months Ended April, 1919

	1919		1918		1919		1918	
	Gallons	Value	Gallons	Value	Gallons	Value	Gallons	Value
Crude mineral oil	11,672,578	$537,847	16,157,468	$830.259	145,651,356	$8,936,055	143 998,382	$6.975,092
Illuminating oil	93,181,947	10,051,032	50,347,085	4,281,504	521,354,359	56,932,297	461,771 212	40,401,781
Lubricating oil	30,115,439	7,939,346	16,184,235	4,481.224	228,925,692	72,143 000	220,065,653	52,800,761
Gasoline, naphtha, etc	27,546,646	6,981,164	46,857,293	11,280,216	410,398,052	102,038,031	366,166 374	88,521,479
Residuum, fuel oil, etc	45,998,713	2,383,711	98,442,888	4,816,190	801,449,637	45,170 766	1,021,249,360	50,023.617
Totals	208,515,323	$27,893,100	227,988,969	$25,689,393	2,107,779,096	$285,220,149	2 213,250,981	$238.722,730

STARTER PRODUCTION DOUBLED

ADRIAN, MICH., May 28—The Adrian Steel Castings Co., which is making an automobile starter, has found it necessary to increase its force to meet the demand for the product. The company is producing approximately 100 starters a day, but with a night shift in action 200 starters will be turned out daily.

Calendar

SHOWS

*Oct. 15—Paris. Grand Palais, International Automobile Mfrs. Congress.

Nov. 7-16—London. Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.

December — Brussels. International Automobile Mfrs. Congress.

January—New York. International Automobile Mfrs. Congress.

February — Chicago. International Automobile Mfrs. Congress.

Feb. 23-Mar. 6 — Birmingham, Eng. British Industries Fair.

TRACTOR SHOWS

June 9-12—Denver, Colo. Sectional Tractor Demonstrations, Denver Tractor Club.

July 14—Wichita, Kan. Automotive Committee of National Implement Assn.

July 28-29—Columbus, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 1-2 — Piqua, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 6-7—Fostoria, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 12-13—Akron, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 18-22—Aberdeen, S. D. Sectional Tractor Demonstrations.

October—Ottawa, Ont., Can. Interprovincial Plowing Match and Tractor Demonstration.

CONTESTS

†June 14—Sheepshead Bay, L. I. Speedway race.

July 4—Tacoma, Wash. Annual speedway races.

July 4—Atlantic City, N. J.—Airplane races—Aeronautic Convention.

*July 5—Cincinnati, O. Speedway.

*July 19—Uniontown, Pa. Speedway race.

*July 26—Sheepshead Bay, L. I. Speedway race.

*Aug. 15 — Middletown, N. Y. Dirt track event.

*Aug. 22-23—Elgin, Ill. Road race.

*Aug. 23—Sheepshead Bay, L. I. Speedway race.

*Sept. 1—Uniontown, Pa. Speedway race.

*Sept. 20—Sheepshead Bay, L. I. Speedway race.

*Sept. 27—Allentown, Pa. Dirt track event.

*Oct. 1—Cincinnati, O. Speedway race.

*Oct. 4—Trenton, N. J. Dirt track event.

*Oct. 11—Danbury, Conn. Dirt track event.

*Tentative dates.
†Sanctioned.

CONVENTIONS

June 2-6—Hot Springs, Va. Convention Automotive Equipment Assn., Homestead Hotel.

June 3-6 — Washington. Pan-American Commercial Conference, Pan-American Building.

June 12-14—Pittsburgh. Annual convention of American Drop Forge Assn. and Drop Forge Supply Assn., William Penn Hotel.

June 16-19—Detroit. American Society of Mechanical Engineers spring meeting, Hotel Statler.

June 23-28—Ottawa Beach, Mich. S. A. E. Mid-summer Meeting.

Sept. 22-24 — Philadelphia. Annual Convention. National Association of Purchasing Agents, Bellevue-Stratford.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

TRACTORS IN CUBA

WASHINGTON, June 2—The tractors used on the sugar estates of Cuba, according to consular report, are of two kinds: the round wheel and the tracklayer types. They are used almost exclusively for plowing. In the northern section of the Cienfuegos Province, owing to the hard, sticky, clayish soils, the tracklayer type seems to be most successful, as it is claimed that round wheel tractors constantly slip with the consequent loss of power and breakdowns. In the central and southern part of this district, the round-wheel tractors seem most successful.

In the southern section tractors of 8 to 16 and 12 to 25 hp. have been used to some extent for hauling purposes as well as in connection with cane planting machines. Experiments have also been made here with the tracklayer type for cultivating between the rows of cane. The chief objections to this type seem to be that its first cost is much higher than the round wheel; that it is complicated and therefore more liable to breakage, and more difficult for inexperienced operators to handle. Several plantations are to experiment with different kinds of tractors, and especially with the tracklayer type, for the purpose of hauling cane.

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JAPANESE ROADS LIMIT CARS

WASHINGTON, June 2—Japanese roads and bridges are so unsatisfactorily constructed that the government is obliged to limit the weight of automobiles to 3000 lb. and trucks to 2 tons complete, with the body weighing not more than 5800 lb., according to a letter received by the Highway Industries Association. A few cities and towns have streets and roads that are practical for passenger hauling, but 90 per cent of these have unsatisfactory bridge conditions. The roads are narrow and it is difficult for two machines to pass. Close to the cities, however, roads have greater width and two trucks can pass without scraping mudguards.

In Tokyo the majority of the streets are from 18 to 20 ft. wide. On all streets under this width a permit from the police is required for travel. There are no sidewalks, and congestion consequently is heavy. The Japanese have not become accustomed to right and left traffic rules and usually keep to the middle of the road.

The Japanese Government has sent a commission of engineers to the United States to study highways and it is expected that this commission will recommend a construction of a national highway system to relieve the present conditions.

China is also looking into the question of improving her highways, and one of the peace commissioners, Dr. Wang, is collecting data on road administration and construction, and will soon visit the United States to make a personal study of this problem.

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REVISED TAX RULING ISSUED

(*Continued from page* 1240)

session an order or contract of sale, with certificate of the purchaser in writing printed thereon or permanently attached thereto, showing that the tires, inner tubes, parts, or accessories so purchased are to be used in the manufacture of new automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories or for sale on automobile trucks, automobile wagons, other automobiles, or motorcycles or in connection therewith or with the sale thereof or for free replacement under contract or guaranty. Following is a form of the certificate or statement which will be accepted:

The undersigned hereby certifies that the tires, inner tubes, parts, or accessories purchased hereunder are purchased with the intention of using them in the manufacture or production of automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories, or for the sale on automobile trucks, automobile wagons, other automobiles, or motorcycles, or in connection therewith or with the sale thereof, or for free replacement under contract or guaranty. In case any of the tires, inner tubes, parts, or accessories sold hereunder are diverted from this use, the purchaser will account for such tires, inner tubes, parts, or accessories to..... ....., the manufacturer thereof, at least once during each calendar year and will pay the tax thereon to him at the time such accounting is made.

Signed.....

If it is impracticable to furnish a certificate for each order a certificate covering all orders between given dates (such period not to exceed a month) will be acceptable. If in any case such an order and certificate cannot be produced on demand of any authorized agent of the department the tax in respect to the sale will be considered in default.

Substitute in place of the next to last sentence of Article 15 of Regulations 47, which reads as follows:

"A chassis is a part of an automobile and taxable at the rate of 5 per cent when sold separately regardless of whether it is a chassis for an automobile truck or wagon or for any other kind of automobile."

"A chassis provided with a superstructure of such design that it is without substantial additions adaptable for hauling heavy loads is an automobile truck or automobile wagon and taxable at the rate of 3 per cent. A chassis not so equipped is an 'other automobile' taxable at the rate of 5 per cent. Unless the manufacturer has actual knowledge that the chassis is to be used as an automobile truck, or automobile wagon, or has in his possession at the time the chassis is shipped or sold (whichever is prior) an order or contract of sale with a certificate of the purchaser in writing, printed thereon, or permanently attached thereto showing that the chassis specified in the order is to be so used, the tax shall be 5 per cent upon the manufacturer's selling price."

Article 34 of Regulations No. 47, entitled "Manufacturer also Retailer" is supplemented by adding a new paragraph to read as follows:

"In cases where it is impracticable to compute the tax in respect to articles sold at retail on the average wholesale price for which like articles were sold during the previous calendar month, the taxpayer has the option of basing the tax upon the ordinary or regular wholesale price for which like articles were sold during the previous calendar month."